

# **Gravina Access Project**

## ***Affected Environment***

## ***Technical Memorandum***



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**Prepared for:**



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## **Summary**

This technical memorandum presents the results of an inventory of the environmental, economic, cultural, and land resources in the Gravina Access Project area. The information contained in this memorandum is drawn from previous technical studies for the Gravina Access Project performed by HDR Alaska, Inc. and its affiliates for the Alaska Department of Transportation and Public Facilities (DOT&PF).

The inventory of these resources provides a general characterization of the resources and issues in the area that may be affected by the proposed alternatives for the Gravina Access Project. The resources described in this memorandum are:

- Land use
- Demographics and personal income
- Community facilities
- Recreation resources
- Economy and economic development
- Geologic resources
- Water resources
- Air quality
- Noise
- Vegetation
- Wildlife
- Historic and archaeological resources
- Visual environment
- Transportation
- Hazardous waste sites
- Utilities
- Natural hazards

## **1.0 Land Use**

The Gravina Access Project area is located in Southeast Alaska in the Ketchikan Gateway Borough and encompasses the western edge of Revillagigedo (Revilla) Island and the eastern edge of Gravina Island, which are separated by Tongass Narrows. The cities of Ketchikan and Saxman are located along the western edge of Revilla Island. Ketchikan International Airport is located on the eastern edge of Gravina Island and accounts for most of the developed land on Gravina Island. Pennock Island is situated between Revilla and Gravina islands in the southern portion of the project area. Pennock Island divides Tongass Narrows into the east and west channels.

### **1.1 Land Ownership**

In the project area, the land on Revilla and Pennock islands is primarily private land or land owned by the Ketchikan Gateway Borough (Borough). The Alaska Department of Natural Resources (DNR) owns a small percentage of land on Revilla Island. Within the project area, DNR owns Refuge Cove State Park, which is located on Revilla Island north of Ward Cove.

Land on Gravina Island is primarily owned and managed by the U.S. Forest Service, DNR, the Alaska Mental Health Trust Authority, the Borough, the University of Alaska, the Alaska Department of Transportation and Public Facilities (DOT&PF), and private individuals. Table 1-1 shows land ownership distribution on Gravina Island.

**Table 1-1. Land Ownership – Gravina Island, 2000**

| <b>Owner</b>                    | <b>Hectares</b> | <b>Acres</b>  | <b>% of Total</b> |
|---------------------------------|-----------------|---------------|-------------------|
| U.S. Forest Service             | 16,000          | 39,425        | 64%               |
| Department of Natural Resources | 3,220           | 7,959         | 13%               |
| Ketchikan Gateway Borough       | 1,950           | 4,822         | 8%                |
| Mental Health Trust Authority   | 1,600           | 3,966         | 6%                |
| University of Alaska            | 703             | 1,737         | 3%                |
| DOT&PF (Airport)                | 690             | 1,704         | 3%                |
| Private                         | 724             | 1,790         | 3%                |
| <b>TOTAL</b>                    | <b>24,887</b>   | <b>61,403</b> | <b>100%</b>       |

Source: HDR Alaska, Inc.

The land on Gravina Island along Tongass Narrows in the project area is primarily owned by DOT&PF (airport reserve), private entities, the Alaska Mental Health Trust Authority, and the Borough. The U.S. Forest Service owns and manages more than half the land on the western portion of Gravina.

### **1.2 Current Land Use**

Land use in the Ketchikan area encompasses a full range of activities, including commercial, industrial, residential, and municipal. The mix of uses typifies a southeastern Alaska waterfront community. Development in the area is limited primarily by steep slopes and poor soils.

Pennock Island is primarily undeveloped with residential land uses along the shoreline. Pennock Island also contains registered archaeological sites.

Gravina Island is relatively undeveloped, with development limited to the airport reserve area and a timber processing plant north of the airport. Also, a few private dwellings are located on the southeastern shore in the Clam Cove area and at the northernmost portion of Gravina Island. The northeastern side of Gravina Island along the coast and north and south of the airport is comprised primarily of lowlands, most of which are wet. The elevation gradually increases towards the center of the island, where it rises to more than 610 meters (2,000 feet) along California Ridge. Land use specific to the various landowners of Gravina Island land are summarized as follows:

U.S. Forest Service: The U.S. Forest Service manages almost half of the land on Gravina Island for timber production. Another large portion of the U.S. Forest Service land is maintained in old-growth forest for wildlife and fish habitat. Smaller parcels of land are managed for maintaining scenic quality while permitting timber harvest. The U.S. Forest Service land on the southern portion of Gravina Island is managed for potential mineral exploration as well as for old-growth habitat and scenic viewsheds.

Alaska Department of Natural Resources: The DNR primarily owns land in the more remote portions of the project area. A small parcel of DNR land reserved for state interests only is located near Clam Cove on the shoreline of Gravina Island. DNR also owns tideland and submerged lands. DNR land west of California Ridge on Vallenar Bay is managed for commercial forest practices, dispersed recreation and public recreation areas, settlement, timber, anadromous streams, and maintaining important habitat areas and wildlife movement corridors. A large parcel of DNR land adjacent to and west of California Ridge is managed for dispersed recreation, timber, wetlands, and habitat/wildlife. DNR land on the southern tip of Gravina Island includes the Blank Islands, Black Sands Beach, and the adjacent marine waters (Icehouse Cove). These areas are to be managed for dispersed recreation, deer habitat, and scenic resources, and have been recommended to be included in the state park system along with the adjacent tidelands. The *Central/Southern Southeast Area Plan Public Review Draft* (December 1999) contains the management intent of all DNR land on Gravina Island.

Mental Health Trust Authority: The Mental Health Trust Authority owns a substantial amount of land within the project area on Gravina Island generally west of the airport reserve. Specific management plans have not yet been developed for this land, however generating revenue is the Authority's main objective. A large portion of the Mental Health Trust Authority's land is located inland, extending west to California Ridge and east to the airport reserve land. Mental Health Trust Authority lands also include smaller areas of land on the southern and northernmost portions of the project area on Gravina Island.

Alaska DOT&PF: Ketchikan International Airport comprises approximately 10.9 million m<sup>2</sup> (2,689 acres) on Gravina Island. The DOT&PF owns the airport, but Ketchikan Gateway Borough manages it through a long-term lease. There is no road access to the airport. An airport-operated ferry transports passengers and vehicles between the airport and Revilla Island. Floatplane facilities, including docks, are located at the airport. The area immediately outside the developed airport site, including runway and clear zones, is considered Airport Reserve land. The designated future uses of this land are for development related only to the

airport and for uses that are consistent with airport operations. Airport Development land is the property located beyond the Airport Reserve. Use and development in this area is designated for auxiliary airport facilities such as hotels, gas stations, parking lots, car rental compounds, and other related uses.

*Private:* Private land on Gravina Island is located both north and south of the airport along the coast. A timber processing plant and other industrial sites including a mill and a construction equipment storage site have been developed on the private land north of the airport. Private land is required to be managed in accordance with the 1996 Ketchikan Gateway Borough Comprehensive Plan and 1989 Coastal Management Program. Parcels of private land designated for residential use are located on Vallenar Bay. Parcels of private land are also located near Seal Cove on the southern portion of Gravina Island.

### **1.3 Regional Land Use Planning Studies**

Current planning studies taking place in the Borough include Ketchikan 2020, which consists of a Gravina Island Comprehensive Plan, Coastal Management Program Update, and a Wetlands and Watershed Development Plan. The purpose of Ketchikan 2020 is to establish and implement a balanced comprehensive plan for the long-range development of the community based on common values and projected land use needs. The Gravina Island Comprehensive Plan allows residents to consider opportunities for developing Gravina Island in tandem with selection of the preferred alternative for improving access to the island. The Coastal Management Plan is based on an operating plan that was adopted in 1984 and updated in the early 1990s. The goal of the Coastal Management Plan Update is to build off the original plan to create a plan that is more responsive and realistic toward the Borough's current and future economic conditions. This plan will strengthen the Borough's say in local development decisions, give increased predictability to developers, and protect sensitive habitats and areas important to the Borough's economy and residents. A Wetlands and Watershed Development Plan will be developed to ensure the development needs of the community are met while following federal wetland permit requirements.

In another planning effort involving the project area, the U.S. Forest Service is preparing an Environmental Impact Statement for the Gravina Island Timber Sale. The Forest Service is proposing to harvest approximately 40 million board feet on 4.5 million m<sup>2</sup> (1,100 acres) of forest land in several timber sales. The proposal includes associated timber harvesting facilities and 39 km (24 miles) of new road with the main portion of the road remaining open for recreational uses after logging is complete. The Draft EIS is scheduled for release in November 2000.

The Ketchikan International Airport Master Plan Update is an ongoing study that will evaluate the needs, development, and facilities of Ketchikan International Airport over the next 20 years. The main objective of the Master Plan Update is to serve the airport's current air traffic demands as well as potentially meet the forecasted future demands. The Ketchikan International Airport Advisory Committee will assist in the development of the Airport Master Plan Update. The committee consists of representatives of air carriers, fixed base operators, airport tenants, airport management, and selected members of the community.

## **2.0 Social and Economic Environment**

### **2.1 Demographics**

#### ***2.1.1 Ketchikan Gateway Borough Population***

In recent years, many changes have affected the Ketchikan area population, including the March 1997 closure of the pulp mill, the decline of the timber industry, the growth of the Ketchikan Shipyard, and the rise of the tourism industry. From 1990 to 1999, the population of the Ketchikan Gateway Borough, including the cities of Ketchikan and Saxman and outlying communities, increased by only 1.0 percent (Alaska Department of Labor and Workforce Development [DOLWD] 2000). The population increased from 13,828 people in 1990 to 13,961 people in July 2000. However, these percentages do not portray the changes that occurred during the intervening years. The population increased annually from 1990 to 1995, reaching a peak of 14,764 in 1995, and then began to decrease. Changes in Ketchikan's economy, including the closure of the Ketchikan pulp mill in 1997, had an effect on the Borough population from 1997 to 1999.

#### ***2.1.2 City of Ketchikan Population***

Over the past decade, the City of Ketchikan population trend has been similar to that of the Ketchikan Gateway Borough. From 1990 to 1999, the city population increased slightly less than the Borough population, from 8,263 people to 8,320 people, or by 0.7 percent. The city population decreased from 1993 to 1995, but then experienced a slight increase from 1995 to 1996, before decreasing again after 1996. This decline in population is in part due to the closure of the pulp mill in 1997.

#### ***2.1.3 Prince of Wales/Outer Ketchikan Population***

The Prince of Wales/Outer Ketchikan census area includes Prince of Wales Island, Annette Island (Metlakatla), and other outlying communities. About 75 percent (4,652 people) of the census area's total population of 6,278 resided on Prince of Wales Island in 1990. The population of this area increased by 5.0 percent from 1990 to 1999, from 6,278 to 6,589 people. The population decline in the Prince of Wales/Outer Ketchikan area is largely the result of the pulp mill closure in Ketchikan and the issuance in 1997 of the Tongass Land Use Management Plan, which reduced allowable harvest levels. The population decreased because many communities on Prince of Wales Island were logging camps or support communities for timber operations.

### **2.2 Employment Trends**

#### ***2.2.1 Ketchikan Gateway Borough Employment***

The number of jobs in the Ketchikan Gateway Borough increased steadily from 1980 until 1995 and began to decrease after 1995. In 1980, the total number of jobs in the Borough was 5,842, compared to 7,025 in 1998; an increase of 20.2 percent for the 19-year period. Because employment increased by 36.6 percent from 1980 to 1995, it is clear that drastic reductions in employment after 1995 had a significant effect on the growth of employment during the entire period.



## **2.2.2 Prince of Wales/Outer Ketchikan Employment**

Employment in the Prince of Wales/Outer Ketchikan census area steadily increased from 1,278 jobs in 1980 to 2,239 jobs in 1991, and then began to fluctuate, resulting in an employment level of 2,201 in 1998. Changes in the forest products industry are the primary cause for fluctuations in total employment in the past few years. The seafood industry contributed to the growth of employment levels through the 1980s.

## **2.3 Personal Income Trends**

### **2.3.1 Ketchikan Gateway Borough Personal Income**

Personal income statistics are a function of several factors, including employment and population, and are a critical indicator of an area's output and economic well being. Personal income is the sum of employment earnings minus social security contributions, other income (rents, dividends, and interest), and transfer payments (social security or welfare payments). If total personal income for an area declines, the decline indicates that the economy cannot support as many jobs as it did previously. In statistical data, personal income is measured before the deduction of personal income taxes and is reported in current dollars, with no adjustment made for price changes (BEA 2000). All personal income levels in this document are expressed in current (nominal) dollars.

The most recent data available from the U.S. Bureau of Economic Analysis (BEA) Regional Economic Information System indicate that total personal income steadily increased in the Ketchikan Gateway Borough until 1996 and decreased by 3.0 percent from 1996 to 1997. Overall, nominal personal income increased by 840 percent from \$44.8 million in 1969 to \$421 million in 1997. While the percent change fluctuated during those years, there was only one instance in which the percent change fell below zero, or personal income actually decreased, and that occurred from 1996 to 1997.

Table 2-1 illustrates personal income, population, per capita personal income, and total private earnings from 1990 until 1997. Total personal income steadily increased until 1996, and then decreased. Per capita personal income, on the other hand, increased until 1995 and then also began to decline. The numerous changes in the seafood and timber industries, which are partially illustrated by the decline of total private earnings after 1996, help to explain these decreases.

**Table 2-1. Ketchikan Gateway Borough Personal Income, 1990-1997**

| <b>Year</b>                     | <b>1990</b> | <b>1991</b> | <b>1992</b> | <b>1993</b> | <b>1994</b> | <b>1995</b> | <b>1996</b> | <b>1997</b> |
|---------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Personal Income (\$ Thousands)  | 364,553     | 368,743     | 383,690     | 401,515     | 413,288     | 431,223     | 433,709     | 420,960     |
| Population (number of persons)  | 13,955      | 14,113      | 14,128      | 14,211      | 14,278      | 14,351      | 14,506      | 13,849      |
| Per Capita Personal Income (\$) | 26,123      | 26,128      | 27,158      | 28,254      | 28,946      | 30,048      | 29,899      | 30,396      |
| Total Private Earnings (\$)     | 242,564     | 238,766     | 245,318     | 255,326     | 256,098     | 274,415     | 274,720     | 253,182     |

Source: BEA 2000.

### **2.3.2 Prince of Wales/Outer Ketchikan Personal Income**

Personal income in the Prince of Wales/Outer Ketchikan census area steadily increased from 1979 until 1997. However, there were decreases in personal income from 1990 to 1991 and from 1995 to 1996. Overall, total personal income increased by 238 percent from \$35.8 million in 1979 to \$121.2 million in 1997.

Table 2-2 illustrates personal income, population, per capita personal income, and total private earnings from 1990 until 1997. Total personal income fluctuated after 1994, but did show an increase from 1996 to 1997. Per capita personal income fluctuated as well and also increased from 1996 to 1997. The numerous changes in the seafood and timber industries, which are partially illustrated by the decline of total private earnings after 1995, help explain these fluctuations.

**Table 2-2. Prince of Wales/Outer Ketchikan Personal Income, 1990-1997**

| <b>Year</b>                     | <b>1990</b> | <b>1991</b> | <b>1992</b> | <b>1993</b> | <b>1994</b> | <b>1995</b> | <b>1996</b> | <b>1997</b> |
|---------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Personal Income (\$ Thousands)  | 112,591     | 108,237     | 110,154     | 114,827     | 116,067     | 121,787     | 116,104     | 121,165     |
| Population (number of Persons)  | 6,295       | 6,439       | 6,421       | 6,761       | 6,910       | 7,100       | 7,147       | 7,147       |
| Per Capita Personal Income (\$) | 17,886      | 16,810      | 17,155      | 16,984      | 16,797      | 17,153      | 16,245      | 16,953      |
| Total Private Earnings (\$)     | 61,228      | 55,769      | 58,482      | 58,431      | 58,915      | 64,215      | 52,124      | 57,840      |

Source: BEA 2000.

### **3.0 Community Facilities (Schools, Churches, Hospitals, Public Safety)**

The Ketchikan Gateway Borough provides an array of community services to the public. Services include educational facilities, including schools and libraries; a police department; fire protection and emergency services; and hospitals and health clinics.

There are eight schools located in the Ketchikan Gateway Borough. One school is located north of the ferry terminal at Point Higgins near Clover Passage; the remainder of the schools is located south of the ferry terminal in the City of Ketchikan.

Ketchikan has one hospital supporting the entire Borough. Ketchikan General Hospital is located at 3100 Tongass Avenue.

The City of Ketchikan operates a Police Department located in downtown Ketchikan. State troopers provide law enforcement outside the City of Ketchikan from a base located approximately 3.22 kilometers (km) (2 miles) north of the airport ferry terminal. Fire Protection and Emergency Services is provided by staff and volunteers of the City of Ketchikan along with local volunteer fire departments run by the Borough service areas. Seven fire stations are located throughout the Borough. All are volunteer except one station located on Main Street in downtown Ketchikan. The average response time for both the city fire station and Emergency Medical Service (EMS) is approximately 4 minutes. The volunteer squads are called on an as-needed basis. Ketchikan International Airport and residents living on the roaded portion of Revilla Island are provided with emergency services. Residents living beyond the road system or on Pennock and Gravina islands are not provided with ambulance or fire services. Emergency fire response service at the airport is provided through the airport.

## **4.0 Recreation Resources**

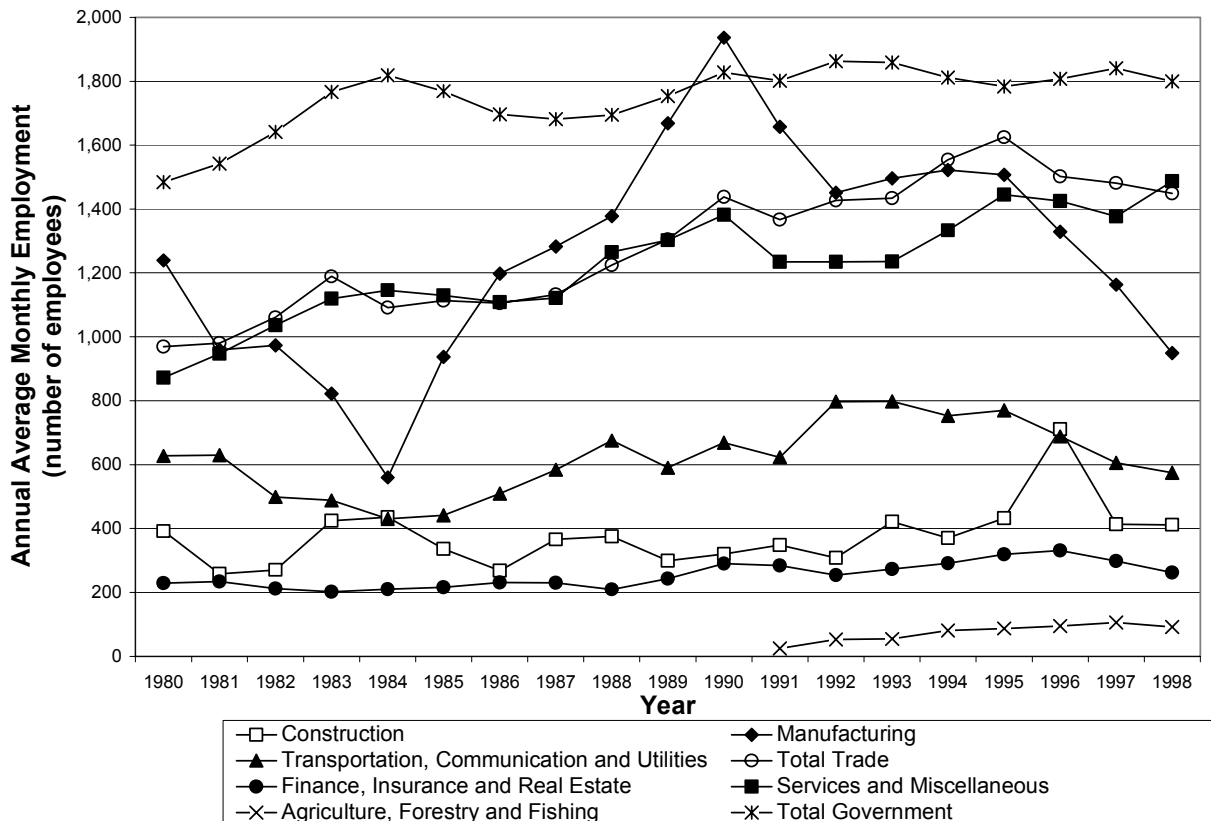
The land on Gravina Island offers a variety of recreational opportunities including fishing, hunting, and hiking. Tongass Narrows is used for recreational boating and fishing. Fishing, hunting, hiking, and biking are popular activities on Revilla Island. The City of Ketchikan includes numerous parks, trails, and recreation areas, as well as tennis courts, playing fields, and indoor recreation centers.

Trends in recreational activities show growth in deer hunting and a decline in sport fishing. The number of hunters increased by 68.8 percent between 1990 and 1997, and the number of hunter days increased by 58.1 percent during that same period. The total number of fishing days has decreased from 91,127 days in 1990 to 83,901 days in 1997.

## 5.0 Economy and Economic Development

In the last few years, the Borough economy has undergone many changes. The increase of the tourism industry and the closing of the pulp mill in 1997 affected other sectors of Ketchikan's economy. Employment by industry from 1980 through 1998, as a measure of Borough economy, is illustrated in Figure 5-1.

**Figure 5-1. Ketchikan Gateway Borough Employment by Industry, 1980-1998**



Source: DOLWD 2000.

Note: Data were not available for the mining industry because of nondisclosure requirements for the entire period and were not available until 1991 for the agriculture, forestry, and fishing industry sector.

Agriculture, forestry, and fishing employment includes those people who receive a wage for fish or timber harvesting and other support industries. Self-employed individuals would not be included. Seafood processors and logging camp employment are included in manufacturing employment.

### 5.1 Forest Products

The forest products industry has been an important part of Alaska's economy for more than half a century. Sitka spruce, hemlock, and other species have been exported as logs, lumber, and timber for the past 40 years. The lower-quality timber was used to produce dissolving pulp, which was sold to produce rayon, pharmaceuticals, and paper products. The market has changed considerably in the last decade with downturns in Asian demand and pricing, and as a result of the reduction in allowable harvest levels in Tongass National Forest, as prescribed in the 1997 Tongass Land Use

Management Plan. The total value of international exports declined by 56.3 percent from \$474.7 million in 1988 to \$207.6 million in 1998, and the value of international exports of soft wood logs declined by 27.8 percent from \$261.6 million in 1988 to \$188.8 million in 1998. The combination of market downturns and reduced harvest levels led to closure of the Sitka pulp mill in 1993 and the Ketchikan pulp mill in 1997.

Because of changes in the forest products industry, including a reduced supply of Tongass National Forest timber and the lower quality of the remaining timber inventory, producers in Ketchikan have begun to explore and develop value-added markets.

## **5.2 Seafood Industry**

Ketchikan's seafood industry, like many industries in the area, is undergoing dramatic changes in response to changes in the world market for salmon, the cornerstone of the industry. The combined effect of the changes within the seafood sector could potentially hurt Ketchikan's economy by reducing employment and earnings for fishermen.

### **5.2.1 Seafood Processing**

Seafood processing in all areas of Alaska is predominantly seasonal. The largest period of seafood processing employment in Ketchikan is during the summer salmon season, when millions of pounds of salmon are processed during a few months. The pink salmon season peaks in August. This is the highest month of seafood processing employment because pinks are the most abundant salmon species in the area. July and September follow August in having the highest monthly employment levels. The difference between employment in August and the winter months of November, December, January, and February is extreme. At times, winter seafood processing employment may be only 10 percent of total August seafood processing employment.

The seafood processing workforce is primarily comprised of nonresidents. The percentage of nonresidents in the Alaska seafood processing industry in 1997 was 73 percent.

Gross earnings for the seafood processing industry in Ketchikan from 1996 to 1998 ranged from approximately \$9.2 million to \$10.4 million. As a share of gross earnings for all industries in Ketchikan, seafood processing was approximately 4.0 percent to 4.4 percent. Seafood processing often involves floating processing vessels that are not counted in Ketchikan seafood processing, but may purchase fish from Ketchikan resident seafood harvesters. In addition, crew members onboard floating processors may visit Ketchikan during shore leave.

### **5.2.2 Ketchikan Commercial Fisheries Employment**

The percentage of the total employed labor force represented by Ketchikan residents employed in Ketchikan commercial fisheries in 1990 was approximately 19.5 percent [Alaska Department of Community and Economic Development (DCED) 2000b; Alaska Commercial Fisheries Entry Commission (CFEC) 2000a and 2000b]. The number of individuals employed in commercial fishing peaked around 1980 and has since declined (CFEC 2000a, 2000b, and 2000c). Commercial fish harvesting employment in 1997 was approximately 700 individuals, down from a peak of approximately 1,100 individuals in 1980. This decline is likely attributable to a decreased level of

profits associated with commercial fishing and restricted access to more fisheries, resulting in a lower rate of participation. A large portion of the employment decline seems to be associated with the salmon troll fishery, which has been put under increasing restrictions over the past several years and represented an extremely large portion of commercial fishing activity by Ketchikan area residents.

Gross earnings of Ketchikan residents involved in the commercial fish harvesting industry were substantially greater in 1997 than in 1975 and 1980, but lower than in 1985, 1990, and 1995.<sup>1</sup> Gross earnings per person have followed the same general trend, although gross earnings per person were greater in 1997 than in 1975, 1980, and 1985. A large portion of the decline may be from a diminished value per pound of salmon since the late 1980s. Table 5-1 illustrates how the number of active permit holders has fallen and the changes in gross earnings from 1975 to 1998.

**Table 5-1. Ketchikan Area Resident Commercial Fishing Gross Earnings, 1975-1998**

| Year | Number of<br>Active Permit Holders | Gross Earnings (\$) |                   |
|------|------------------------------------|---------------------|-------------------|
|      |                                    | Total               | Per Permit Holder |
| 1975 | 435                                | 2,418,754           | 5,560             |
| 1980 | 445                                | 8,975,419           | 20,169            |
| 1985 | 385                                | 16,417,737          | 42,643            |
| 1990 | 334                                | 17,978,988          | 53,829            |
| 1995 | 314                                | 18,256,429          | 58,141            |
| 1996 | 296                                | 16,040,468          | 54,191            |
| 1997 | 283                                | 14,499,301          | 51,234            |
| 1998 | 269                                | <sup>a</sup>        | <sup>a</sup>      |

Sources: CFEC 2000a and 2000b.

<sup>a</sup> 1998 gross earnings data are not yet available.

### 5.3 Tourism

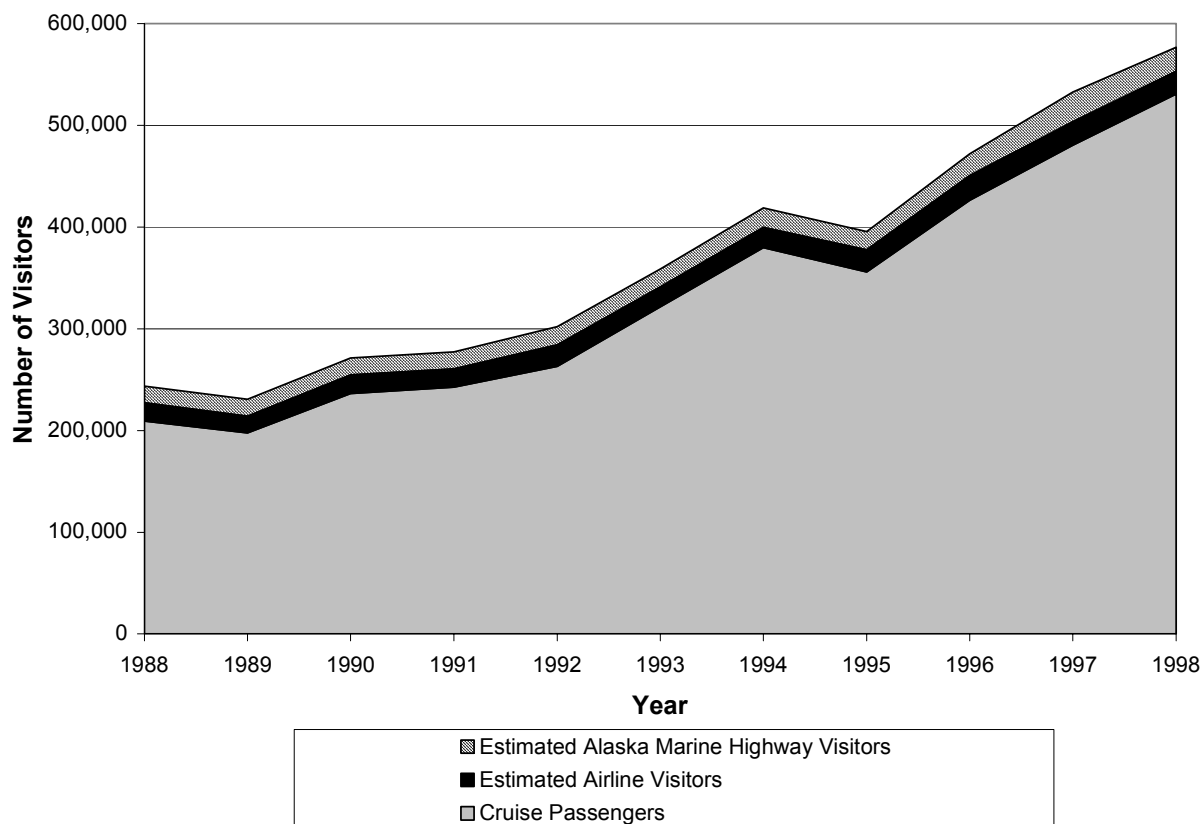
The Ketchikan area, like many areas, has benefited from the substantial growth in the tourism industry in Alaska. The total number of summer visitors to Alaska increased by 128 percent from 1985 to 1998. However, the growth of tourism has slowed in recent years. The percent increase in visitors from summer 1995 to summer 1996 was 10.1 percent; from summer 1996 to summer 1997, the increase was only 5.3 percent. Between the summers of 1997 and 1998, the growth in tourism was even less, only 1.3 percent. During the 12-month period from October 1997 through September 1998, 1.35 million nonresident visitors, including vacationers and business travelers, came to Alaska (The McDowell Group, 1999). The Alaska visitor market has grown at a rapid rate over the last few

<sup>1</sup> Gross earnings data are representative only of Ketchikan resident permit holders making landings in a given year. Crewmembers that reside in Ketchikan and are employed by Ketchikan resident permit holders typically work for a share of gross revenue and would have their earnings included in Ketchikan resident permit holder gross earnings. Earnings of Ketchikan resident crewmembers employed by permit holders not residing in Ketchikan are not included in Ketchikan gross earnings data. Therefore, actual gross earnings of persons in the commercial fish harvesting sector are likely to be higher than reported. Crewmember gross earnings data were not available.

years because of an increasing interest in Alaska as a vacation destination and the rapid growth of the cruise industry.

The Ketchikan area has benefited from increased tourism to Alaska in many ways, in terms of both spending and employment. Figure 5-2 depicts the growth of the number of summer visitors to the Ketchikan area from 1988 to 1998. Over the 10-year period, there was a 137 percent increase in summer visitors, with the cruise industry playing a major role in this growth.

**Figure 5-2. Estimated Number of Visitors to Ketchikan, 1988-1998**



Sources: Ketchikan Visitors Bureau 1999; The McDowell Group 1998.

Table 5-2 provides an overview of spending by visitors to Ketchikan based on 1990 data from all known sources of visitors, including visitors from other areas of Alaska. The level of growth in visitors from 1988 to 1998 suggests that the 1990 visitor spending data are conservative estimates of estimated current visitor spending. The cruise industry in Ketchikan alone now accounts for more than \$40 million in spending by summer visitors in Ketchikan, more than \$2 million in spending by cruise ship crews, and \$40 million in direct spending by the cruise lines.



**Table 5-2. Total Visitor Spending in Ketchikan, 1990**

| Industry Sector | Visitor Spending (\$Millions - 1990 Dollars) |  |                | Total |
|-----------------|--|--|----------------|-------|
|                 | Non-Alaskan<br>Visitors                      | Alaskans from<br>Prince of Wales and<br>Metlakatla | Other Alaskans |       |
| Transportation  | 8.0  | 5.5  | 1.0            | 14.5  |
| Retail          | 9.9  | 4.9  | 1.2            | 16.0  |
| Services        | 5.7  | 0.7  | 0.6            | 7.0   |
| Total           | 23.6   | 11.1   | 2.8            | 37.5  |

Source: The McDowell Group 1992.

## 5.4 Government

Government employment and spending play an extensive role in the Ketchikan area economy and in southeastern Alaska in general. Local and state government employment is heavily dependent on the population of the area, the demand for government services, and available revenue. Government jobs represented 1,800 jobs or 25.6 percent of total wage employment in the Borough in 1998 and an average of 25.9 percent of employment over the 1980 through 1998 period.

## 5.5 Transportation

### 5.5.1 Ketchikan International Airport Employees

The airport employs approximately 185 employees during the summer and 136 employees during the winter months. Major employers at the airport include Alaska Airlines, Taquan Air, Ketchikan Gateway Borough, the Federal Aviation Administration (FAA), Aero Service, and Pro Mech. The airport ferry employs 11 people on a permanent basis and adds up to three people on a seasonal basis; this does not include mechanics and administrative personnel whose responsibilities include all airport facilities and who dedicate only a fraction of their time to the ferry facilities.

### 5.5.2 Alaska Ship and Drydock, Inc.

Alaska Ship and Drydock, Inc. (ASD) has been an important part of Ketchikan's economy since the late 1970s. Annual ASD gross revenue has increased from \$2.4 million in 1994 to \$14.9 million in 1999. ASD employment has also increased, from 21 employees in 1994 to 109 employees in 1999.

In the late 1970s, Ketchikan community leaders recognized that constructing a shipyard capable of supporting the Alaska Marine Highway System ferries could strengthen southeastern Alaska's economy. With the assistance of the Alaska congressional delegation, Ketchikan and ASD are planning to develop the Ketchikan Shipyard into a world-class building and repair facility for ships. The goal is to help to expand Ketchikan's role as Alaska's premier maritime support community (Alaska State Chamber of Commerce, 2000).

### 5.5.3 Alaska Marine Highway System and Inter-Island Ferry Authority

The Alaska Marine Highway System is another important employer in the Ketchikan area. From 1990 to 1999, regular wintertime full-time employment has decreased from 564 employees to 538

employees, a decline of 4.6 percent. Regular summertime full-time employment has increased from 582 employees to 660 employees, an increase of 13.4 percent.

The Inter-Island Ferry Authority estimates that in its first full year of operation, 38 jobs will be created: 16 deck and engine crew jobs, 12 food and beverage jobs, and 10 shore-side staff jobs.

## 5.6 Subsistence

Subsistence is a major element of cultural and economic life for many southeastern Alaskan residents. Hunting, fishing, trapping, and gathering activities are sometimes used to supplement personal income and provide needed food. Resources such as salmon, abalone, and clams in the ocean, and berries, cedar bark, and numerous species of birds and mammals found in the forest enable a rich and varied diet. Subsistence activities are also important to certain cultural customs and traditions.

A large segment of Saxman residents engages in subsistence practices in the surrounding region. Table 5-3 illustrates the resources harvested by Saxman residents in 1987.

**Table 5-3. Saxman Wild Resources Harvest Survey, 1987**

| Resource Category    | Using | Harvesting | Receiving | Giving | Estimated<br>Kg<br>(Pounds) | Avg. Kg<br>(Pounds) | Per Capita<br>Kg<br>(Pounds) |
|----------------------|-------|------------|-----------|--------|-----------------------------|---------------------|------------------------------|
| All Resources        | 96.7% | 83.4%      | 95.3%     | 44.8%  | 10,973<br>(24,192)          | 144<br>(318)        | 43<br>(94)                   |
| Fish                 | 93.4% | 64.1%      | 85.4%     | 25.4%  | 6,102<br>(13,452)           | 80<br>(177)         | 24<br>(52)                   |
| Salmon               | 88.7% | 58.0%      | 50.5%     | 14.6%  | 3,900<br>(8,598)            | 51<br>(113)         | 15<br>(33)                   |
| Non-Salmon Fish      | 88.7% | 59.9%      | 78.7%     | 25.4%  | 2,202<br>(4,854)            | 29<br>(64)          | 9<br>(19)                    |
| Land Mammals         | 57.5% | 26.3%      | 42.0%     | 14.6%  | 2,401<br>(5,293)            | 32<br>(70)          | 9<br>(20)                    |
| Large Land Mammals   | 57.5% | 26.3%      | 42.0%     | 14.6%  | 2,401<br>(5,293)            | 32<br>(70)          | 9<br>(20)                    |
| Small Land Mammals   | 0.0%  | 0.0%       | 0.0%      | 0.0%   | 0                           | 0                   | 0                            |
| Marine Mammals       | 26.8% | 7.5%       | 19.3%     | 3.3%   | 258<br>(568)                | 3<br>(7)            | 1<br>(2)                     |
| Birds and Eggs       | 3.3%  | 3.3%       | 0.0%      | 0.0%   | 58<br>(128)                 | 1<br>(2)            | 0.2<br>(0.5)                 |
| Marine Invertebrates | 72.1% | 42.9%      | 51.4%     | 19.3%  | 1,680<br>(3,704)            | 22<br>(49)          | 6<br>(14)                    |
| Vegetation           | 85.4% | 74.0%      | 45.3%     | 28.7%  | 475<br>(1,047)              | 6<br>(14)           | 2<br>(4)                     |

Source: ADF&G Subsistence Division

Local subsistence use areas in the project area include Pennock Island and Bostwick Bay/Inlet/Creek on southeastern Gravina Island, which is a popular subsistence area for fish, wildlife, shellfish, and seaweed.

## **6.0 Physical Environment**

### **6.1 Geology, Topography, and Soils**

#### **6.1.1 Geology and Topography**

Glacial ice and erosion shaped the landforms in the project area, as is evidenced by the rounded slopes, U-shaped valleys, exposed smooth bedrock, fiords, and glacial mountain lakes visible everywhere. Tectonic activity is also responsible for the development of landforms in the project area. Such physical features as Tongass Narrows, Vallenar-Bostwick Valley, and Carroll Inlet are examples of features formed by tectonic activity.

As a result of deposition during glacial time, unconsolidated deposits such as marine deposits, beach and stream deposits including alluvial fan and fan-delta deposits, muskeg, and colluvium deposits overlay the bedrock. The marine deposits consist of poorly graded, fine-grained sand with some gravel and silt. Fan-delta deposits consist of sand, gravel, and boulders and become finer grained seaward. The deposits are present at the mouths of Ketchikan, Carlanna, and Hoadley creeks and other smaller streams that flow into Tongass Narrows. They also are associated with streams on Gravina Island that flow into Tongass Narrows. The fan-delta deposits generally have a loose to medium density and are saturated.

A network of faults dissects southeastern Alaska owing to the tectonic activity there. The Queen Charlotte-Fairweather fault, which is known to be active, represents the boundary between the North American and Pacific plates. This fault line is oriented northwest-southeast and is approximately 160 to 180 km (100 to 110 miles) southwest of Ketchikan. The Chatham Strait fault line is east of the Queen Charlotte-Fairweather fault and oriented in a north-northwest to south-southeast direction. It intersects the Queen Charlotte Fairweather fault southwest of Ketchikan. The Chatham Strait fault offset rocks as much as 95 miles when it was active 2 to 65 million years ago. The Clarence Strait fault is in Clarence Strait, which is just west of Gravina Island, and has approximately 14.5 km (9 miles) of displacement.

#### **6.1.2 Soils**

With little seasonal variation, the heavy precipitation and cool temperatures of the area make climate the most influential factor on soil characteristics in the area. The region's soils are incessantly wet. The cool, wet climate of the region results in slow rates of decomposition of organic matter and highly acidic soils low in available nutrients. Glacial till or bedrock is normally found beneath the soil in Ketchikan, and are often responsible for the poorly drained soils on gentle slopes.

The region's soils are generally forested soils or muskegs high in organic matter. Muskegs are commonly found on level or gently sloping landforms and have poor drainage. Gravina Island is mainly made up of muskeg and poorly drained-forested soils. The eastern portion of Gravina Island and most of Pennock Island is primarily muskeg. Forested soils occur in a range of geomorphologic conditions, from lowlands to rocky sideslopes to steep slopes. Forested soils are generally moderately well drained with some well and poorly drained soils in certain areas. The depth to bedrock in both forested soils and muskegs ranges from 0 to 5+ meters (0 to 15+) feet.

## **6.2 Water Resources**

In addition to Tongass Narrows, the most significant water bodies located in the project area are: Lewis Reef Creek, Government Creek, and Clam Clove on Gravina Island; and Hoadley Creek, Ketchikan Creek, Carlanna Creek, and Ward Cove and Creek on Revilla Island. The U.S Geological Survey, U.S. Fish and Wildlife Service, U.S. Forest Service, Alaska Department of Fish and Game (ADF&G), Alaska Department of Environmental Conservation (ADEC) and the National Marine Fisheries Service were contacted to obtain existing water quality and flow data on the water bodies within the project area. The amount of available information for water bodies in the Ketchikan area is limited. This memorandum summarizes the characteristics of these water bodies and the wildlife they support, based on available information.

### **6.2.1 Surface Water**

#### **Tongass Narrows**

Tongass Narrows is a relatively narrow channel running between Gravina Island and Revilla Island. Much of Tongass Narrows is included in the Gravina Access Project area. The southeastern end of the Narrows splits into the East Channel and West Channel around Pennock Island. At the south end of Pennock Island, the Narrows meets the northern end of Nichols Passage. The northwestern end of the Narrows opens into Clarence Strait.

Tongass Narrows is characterized by strong tidal currents and by steep bedrock or coarse gravel/cobble/boulder shorelines. The waterway experiences large tidal ranges, as indicated in Table 6-1.

**Table 6-1. Tide information for Tongass Narrows**

|                               |                   |
|-------------------------------|-------------------|
| Extreme High Water (EHW)      | +6.1 m (+20.0 ft) |
| Mean Higher High Water (MHHW) | +4.7 m (+15.4 ft) |
| Mean High Water (MHW)         | +4.4 m (+14.5 ft) |
| Mean Tide Level               | +2.4 m (+8.0 ft)  |
| Mean Lower Low Water (MLLW)   | 0.0 m (0.0 ft)    |
| Extreme Low Water (ELW)       | -1.5 m (-5.0 ft)  |

Source: National Oceanic and Atmospheric Administration (NOAA), July 1978.

In undeveloped areas, mainly on Gravina and Pennock islands, Tongass Narrows is primarily steep bedrock or coarse gravel/cobble/boulder. Much of the lower intertidal and shallow subtidal areas are sandy or mixed gravel, sand and shell, with varied amounts of silt. Rocky points, mainly along the northwest shore of Pennock Island, have steep bedrock slopes extending to subtidal depths. Several small natural coves and areas protected by constructed breakwaters provide wave and current protection for anchorages and marine habitats. These locations, which include Ward Cove, have sandy or gravel bottoms.

## **Project Area Watersheds**

Project area watersheds were mapped in GIS and the watershed boundaries delineated. GIS was used to calculate watershed size (area). The following paragraphs characterize the watersheds based on size and the major water bodies contained within each watershed.

### ***Revilla Island Watersheds***

The Ward Cove Creek watershed is approximately 20 square kilometers (km<sup>2</sup>) (4,951 acres) in size. The watershed, which includes Ward Lake, Ward Cove Creek, Signal Creek and eight other tributary streams, flows to Ward Cove's northern shoreline (Tongass Narrows). From Ward Lake, Ward Cove Creek is 0.8 km [0.5 miles] in length before reaching Ward Cove. Tributaries for Ward Lake start as far as 4.8 km (3.0 miles) north of the lake. To the south, Signal Creek is 2.3 km (1.4 miles) in length before deposition of its waters into Ward Lake.

Carlanna Creek watershed is approximately 6.4 km<sup>2</sup> (1,589 acres) in size. The watershed, which includes Carlanna Lake and Carlanna Creek, is located along the western edge of Ketchikan's city limits. From its headwaters at Carlanna Lake, Carlanna Creek is 1.4 km (0.9 miles) in length before reaching Tongass Narrows. Another major tributary (other than Carlanna Lake) that adds to the Carlanna Creek flow, it is located to the west, this tributary is 2.1 km (1.3 miles) in length before its confluence with Carlanna Creek.

Hoadley Creek watershed is approximately 5 km<sup>2</sup> (1,242 acres) in size. The watershed, which includes Hoadley Creek and its tributaries, is located within the western half of Ketchikan's city limits. Hoadley Creek is 2.7 km (1.7 miles) in length before reaching Tongass Narrows.

Ketchikan Creek watershed is approximately 47 km<sup>2</sup> (11,575 acres) in size. The watershed includes Ketchikan Creek and its tributaries, Upper and Lower Ketchikan lakes, Fawn Lake, Scout Lake and the Granite Basin Area. This large area deposits its waters into Tongass Narrows through Ketchikan Creek, which outputs near the eastern side of Ketchikan's city limits. Ketchikan Creek, from its headwaters stretches approximately 10.5 km (6.5 miles) before reaching the Narrows [3.4 km (2.1 miles) from the southern end of Lower Ketchikan Lake]. A major tributary to Ketchikan Creek, the Granite Basin Area, collects water for approximately 5.8 km (3.6 miles) before the Basins water confluence's with Ketchikan Creek and flows an additional 3.4 km (2.1 miles) to Tongass Narrows.

### ***Gravina Island Watersheds***

Lewis Point Creek watershed is approximately 7.4 km<sup>2</sup> (1,838 acres) in size. The watershed, which includes Lewis Point Creek and its tributaries, deposits its waters into Tongass Narrows. Lewis Point Creek is 3.1 km (1.9 miles) in length before reaching the Narrows.

Government Creek watershed is approximately 7.6 km<sup>2</sup> (1,868 acres) in size. The watershed includes Government Creek and its tributaries, and a large number of unnamed lakes. Very little topographic relief exists in this watershed, which deposits waters into Tongass Narrows on the

northern border of Gravina Island. Government Creek is 4.0 km (2.5 miles) in length before reaching the Narrows.

Clam Cove watershed is approximately 14 km<sup>2</sup> (3,533 acres) in size. This watershed is characterized by very little topographic relief, which accounts for the large number of lakes throughout its area without a major source of water transportation (i.e., streams, rivers). This watershed is located in the northeastern-most part of Gravina Island, paralleling Tongass Narrows.

### **6.2.2 Hydrologic Characteristics of Project Area Streams**

Information on flow characteristics of the streams within the project area is limited. The U.S. Forest Service, in its the Water Resources Atlas (April, 1979), reported on water flow characteristics at Ketchikan Lakes and Carlanna Lake, which are upstream from where the project area crosses Ketchikan and Carlanna creeks. Based on an annual average, monthly flow in the Ketchikan Lakes area [drainage area: 20 km<sup>2</sup> (8.1 square miles)] is approximately 245,500 liters per minute (Lpm) [54,000 gallons per minute (gpm)], with highs in June and October [averages of 341,000 Lpm (75,000 gpm) and 409,000 Lpm (90,000 gpm), respectively] and lows in March [77,300 Lpm (17,000 gpm), on average]. For Carlanna Lake [drainage area: 4 km<sup>2</sup> (1.5 square miles)], the average monthly flow is approximately 34,100 Lpm (7,500 gpm) with highs in June and October [averages of 59,100 Lpm (13,000 gpm) and 54,600 Lpm (12,000 gpm), respectively], and lows in March [12,300 Lpm (2,700 gpm), on average]. There are no other known flow data available for streams in the area.

### **6.2.3 100-year Floodplain**

The Federal Emergency Management Agency (FEMA) has mapped the expected 100-year floodplain for a small portion of the Ketchikan Gateway Borough (i.e., primary population areas). The limits of the FEMA study extend from 0.8 km (0.5 miles) north of Carlanna Creek to the Coast Guard Station within Ketchikan. Much of Ketchikan, including the Schoenbar, Hoadley, and Carlanna Creek areas lie within the floodplain of a 100-year flood (FEMA, 1990).

### **6.2.4 Water Quality**

Activities that could affect marine water quality in the project area include discharge from seafood processing plants, logging and associated timber industry facilities, and discharge from cruise ships. Logging activities also could affect freshwater water bodies.

Five seafood processors (Ward Cove Packing, Alaska General Seafoods, Trident Seafoods, E.C. Phillips, and Norquest) have fish waste outfalls that discharge into deeper waters in Tongass Narrows adjacent to their facilities. Processors discharge under a National Pollution Discharge Elimination System (NPDES) general permit for Alaskan shore based seafood processors regulated by the U.S. Environmental Protection Agency (EPA). Under permit requirements, the discharge outfalls are situated in continually flushed underwater areas. The processors must perform dive surveys at the outfall area approximately each year depending on the amount of discharge (Carroll, 2000).

Cruise ship discharges could potentially affect water quality throughout southeastern Alaska's marine waters. According to 40 CFR 122.3 (a), discharges of (treated) sewage, effluent from



properly functioning marine engines, laundry, shower, and galley sink wastes (“greywater”), or any other discharges “incidental to the normal operation of a vessel,” are exempt from the requirement to obtain a NPDES permit. Cruise ships may discharge at any location. Currently, the Alaska Department of Environmental Conservation (ADEC) is leading discussions concerning waste management and disposal practices of cruise ships while in state waters with the cruise ship industry and the state and federal agencies. The discussions will result in a determination of discharge rates, types, and areas within southeastern Alaska. Additionally, ADEC will attempt to work with the industry on volunteer mitigation of suspected problems or, if necessary, enforceable regulations (Rodgers, 2000).

Logging activities are potentially harmful to surface water resources as a result of vegetation clearing, which could increase the likelihood of sediment transport to nearby streams. Log transfer facilities and timber processing plants on the shoreline can affect water quality by introducing naturally occurring chemicals to areas that would not be exposed to the chemicals under natural circumstances (e.g., Ward Cove).

The ADEC, Division of Air and Water Quality regulates water quality in the State of Alaska. In 1994, the ADEC placed Ward Cove on the water quality-impaired water bodies list [as per Section 303(d) of the Clean Water Act, which requires states to report on waters that carry pollutants in excess of the state’s water quality standards] for exceedances of the standards for sediment, dissolved oxygen (DO), color, and toxic substances. The ADEC removed color from the listing in 1997. The ADEC completed assessments on Ward Cove and will begin preparation of a water body recovery plan. Recent studies in Ward Cove showed that bottom sediments and accumulations of decomposing wood debris generate hazardous substances that are toxic to benthic organisms, and contribute to seasonal depressions in DO. Water sampling (August 1998) showed severe depressions in DO. At one sampling location, the layer of water that was below Alaska water quality criteria for DO was up to 30 m (98 ft) deep (ADEC 1998).

There are no other known water quality data available for other streams in the project area.

### **6.3 Air Quality**

The air quality in the Ketchikan area is generally good. There have been no recorded exceedances of National Ambient Air Quality Standards (NAAQS) in the area. The ADEC has conducted ambient air quality monitoring for particulate matter in the Ketchikan area during the winter months (i.e., smoke season – December/January) to characterize the effects of the use of wood for heating fuel on ambient air quality. These monitoring efforts showed that levels of particulate did not approach or exceed the NAAQS (December, 1996).

Cruise ships are sources of marine fuel combustion and, as such, are a source of air pollution. Their contribution of pollutants to the air can adversely affect ambient air quality on microscale or middle-scale (Heffern, 2000). Fuel burned in ship boilers and generators produces a variety of air pollutants, including nitrogen oxides (NO<sub>x</sub>), sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO), and particulates. The Alaska Air Quality Control Plan places restrictions on the density of smoke, or “opacity” that any marine vessel can emit from its smokestacks. In general, if a ship is stationary at

dock, it cannot have an opacity level greater than 20 percent, except for 3 minutes in any one-hour period (Pavitt, 2000).

## **6.4 Noise**

### ***6.4.1 Noise Sources***

Noise in the project area is generally attributed to airplanes, floatplanes, helicopters, private and commercial boats, and vehicular traffic. While these noise sources are present year-round, noise in the project area generally increases during the summer months because activities related to these noise sources increase during that time. Airplanes frequent more takeoffs and landings, there are more private and commercial boats travelling the Narrows, and floatplane and helicopter traffic is considerably greater as a result of increased tourist activity, travel, and recreation. Cruise ships also contribute to noise during the summer season. Vehicular traffic from Tongass Avenue and other intermittent noise sources in the project area including general industrial and commercial activities, all contribute to noise levels.

### ***6.4.2 Sensitive Receptors***

Areas sensitive to excessive noise that are in the vicinity of the project area include schools, hospitals, residences, and future residential development. Totem Bight State Historic Park, Refuge Cove State Park, and Ward Lake Recreation Area on Revilla Island, along with harbors, scenic view areas, bike paths, and boating activities are all sensitive to excess noise.



## **7.0 Biological Resources**

### **7.1 Vegetation**

There are three main types of vegetative communities in the project area: uplands, wetlands, and aquatic habitat. The vegetation in these communities is described in the following sections.

#### **7.1.1 Upland Areas**

In the project area, upland habitat consists of land above mean high water. Coniferous rain forests dominate the uplands within the Gravina Access Project area. The major climax forest type is mature western hemlock-Sitka spruce. Other tree species in the forest include western red cedar, Alaska or yellow cedar, mountain hemlock, red alder, Sitka alder, and lodgepole pine. The understory consists of skunk cabbage, red elderberry, salal, devil's club, rustyleaf, menziesia, salmonberry, thimbleberry, blueberry, huckleberry, ferns and mosses and lichens (Ketchikan Gateway Borough, 1994).

A beach fringe vegetative community type exists parallel to the coastline throughout much of the project area. The community consists of Oregon crab apple, red alder, Sitka alder, willow, red-oiser dogwood, and grasses and sedges (Meehan, 1974). Coastal forests temporarily retain and filter rain, controlling the flow and quality of fresh water to the sea.

#### **7.1.2 Wetlands**

Information on wetlands in the project area is based on National Wetland Inventory maps and field survey conducted by HDR Alaska, Inc., in January and June 2000. The Gravina Access Project area includes: forested wetlands; open, "muskeg"-type wetlands; and estuarine meadow wetlands.

Forested wetlands are prominent northeast of the airport and at some of the potential departure points for the alternatives on Revilla Island. They are generally drier than other wetlands, either because they are on topographically higher or steeper sites, or because their substrates drain better internally. They are found, in particular, along larger creeks and as a fringe along the beaches of Gravina and Pennock islands. They are also interspersed with the "muskeg" wetlands. A mix of conifer species, including shore pine, red and yellow cedar, western hemlock, and less Sitka spruce characterizes them the forested wetlands. The trees appear stunted relative to those that are found in a better-drained forest. The understory supports a dense growth of blueberry, huckleberry, rusty menziesia, salal, and an herb ground cover.

Open, "muskeg"-type wetlands are the dominant wetland type in the areas west and south of the airport and on Pennock Island. These open wetlands are intricately interspersed with small patches of forested wetland. The open areas are characterized by low shrub and herb vegetation, such as sweetgale, blueberry, crowberry, and short sedges, and by water pooled on the surface. Typically, wetlands with such vegetation are associated with deep accumulations of peat. However, most of the open wetlands observed in the field study had only a shallow layer of organic matter over a mineral soil. Many of the wetlands were moderately sloped and had water flowing through them. Flowing water, as well as contact between that water and mineral soil, usually leads to a more nutrient-rich and productive biological community. If these wetlands had deep peat, most of them would be

categorized as “fens,” which are less acidic and more nutrient-rich than “bogs.” The term “fen” will be used loosely to describe these areas even though they do not have deep peat accumulations. Some true bogs, with deep deposits of peat and less flowing water, have also been observed within the project area.

Estuarine meadows exist along the shore of Gravina Island. At elevations near the highest tides, these meadows are dominated by grasses, and sedges and herbs are prominent near the more average high tide elevations. These meadows may be supported by seepage of freshwater out of the beach gravels. They are highly productive habitats and much organic matter produced within them washes into the marine ecosystem where it supports food webs. The beach meadows are important feeding areas for many terrestrial and aquatic species of wildlife, including deer, black bear, river otter, mink, shorebirds, waterfowl, and songbirds. They provide succulent forage in spring when other habitat types may be snow-covered. They also serve as nurseries for young fish. Estuarine habitats are relatively scarce in southeastern Alaska.

### 7.1.3 Aquatic Habitats

Fifty-six plant and 137 animal taxa were identified in fieldwork completed in the intertidal zone in January 2000. In areas where natural coarse gravel/cobble/boulder shorelines occur, rockweed (*Fucus gairdneri*), barnacles (*Balanus glandula*, *B. crenatus*, *Semibalanus cariosus*) *Chthamalus dalli*, snails (*Littorina scutulata*, *L. sitkana*, Lottidae, unidentified), and crab (*Hemigrapsus nudus*) dominated. In areas where seastars (*Pycnopodia helianthoides*) were limited, intertidal areas had abundant mussel (*Mytilus edulis*) populations.

Subtidal margins of Tongass Narrows are characterized by steeply sloping bedrock or coarse gravel/cobble bottoms extending from the lower intertidal zone to the deeper flatter center of the channel at depths of –24.4 to –45.7 m (-80 to –150 ft) MLLW. For the most part, these subtidal slopes are swept by strong tidal currents and support a number of kelp and other algal species down to depths of about –12.2 m (-40 ft) MLLW. In spring and summer, many of these rocky areas support a canopy of bull kelp. At depths below –12.2 m (-40 ft) MLLW, the bottom becomes nearly barren sand and gravel. The most abundant subtidal organism observed in the project area in the winter is sea cucumber (*Parastichopus californicus*).

Shallow subtidal areas that are protected from direct impact of the currents in small coves or behind breakwaters have gradually sloping sandy bottoms that often support healthy eelgrass beds. Eelgrass beds are found along in shallow waters along Revilla Island north of Refuge Cove, near the floatplane dock south of the mouth of Ward Cove, north of the Amerigas dock, north of the Bar Point Marina breakwater, and south of the entrance to the Thomas Basin Marina. Eelgrass beds are found in shallow waters adjacent Gravina Island between the small cove north of the runway and the floatplane dock, and just south of the sunken tugboat in Tongass Narrows West Channel.

## 7.2 Wildlife

Table 7-1 identifies the wildlife species commonly occurring in the project area. The following sections describe these species and their habitat.

**Table 7-1. Common Animal Species Found within the Gravina Access Project Area**

| Terrestrial Mammals   | Birds   |
|---|---|
| <ul style="list-style-type: none"> <li>Alexander Archipelago (gray) wolf (<i>Canis lupus</i>)</li> <li>Beaver (<i>Castor canadensis</i>)</li> <li>Black bear (<i>Ursus americanus</i>)</li> <li>Deer mouse (<i>Peromyscus maniculatus</i>)</li> <li>Dusky shrew (<i>Sorex obscurus</i>)</li> <li>Land or river otter (<i>Lutra canadensis</i>)</li> <li>Little brown myotis (bat) (<i>Myotis lucifugus</i>)</li> <li>Long legged myotis (bat) (<i>Myotis longicaudus</i>)</li> <li>Meadow vole (<i>Microtus pennsylvanicus</i>)</li> <li>Mink (<i>Mustela vison</i>)</li> <li>Northern flying squirrel (<i>Glaucomys sabrinus</i>)</li> <li>Pine marten (<i>Martes americana</i>)</li> <li>Red squirrel (<i>Tamiasciurus hudsonicus</i>)</li> <li>Red-backed vole (<i>Clethrionomys rutilus</i>)</li> <li>Sitka black-tailed deer (<i>Odocoileus hemionus sitkensis</i>)</li> </ul> | <ul style="list-style-type: none"> <li>Pacific loon (<i>Gavia pacifica</i>)</li> <li>Mew gull (<i>Larus canus</i>)</li> <li>Herring gull (<i>Larus thayeri</i>)</li> <li>Glaucous-wing gull (<i>Larus glaucescens</i>)</li> <li>Common murre (<i>Uria aalge</i>)</li> <li>Marbled murrelet (<i>Brachyramphus marmoratus</i>)</li> <li>Pelagic cormorant (<i>Phalacrocorax pelagicus</i>)</li> <li>Canada goose (<i>Branta canadensis</i>)</li> <li>Mallard (<i>Anas platyrhynchos</i>)</li> <li>Oldsquaw (<i>Clangula hyemalis</i>)</li> <li>Surf scoter (<i>Melanitta perspicillata</i>)</li> <li>White-winged scoter (<i>Melanitta fusca</i>)</li> <li>Barrow's goldeneye (<i>Bucephala islandica</i>)</li> <li>Western grebe (<i>Aechmophorus occidentalis</i>)</li> <li>Bufflehead (<i>Bucephala albeola</i>)</li> <li>Common merganser (<i>Mergus merganser</i>)</li> <li>Common tern (<i>Sterna hirundo</i>)</li> <li>Bonaparte's gull (<i>Larus philadelphia</i>)</li> <li>Northwestern crow (<i>Corvus caurinus</i>)</li> <li>Common raven (<i>Corvus corax</i>)</li> <li>Varied thrush (<i>Ixoreus naevius</i>)</li> <li>Dark-eyed junco (<i>Junco hyemalis</i>)</li> <li>Red crossbill (<i>Loxia curvirostra</i>)</li> <li>Rock dove (<i>Columba livia</i>)</li> <li>Steller's jay (<i>Cyanocitta stelleri</i>)</li> <li>Chestnut-backed chickadee (<i>Parus rufescens</i>)</li> <li>Bald eagle (<i>Haliaeetus leucocephalus</i>)</li> <li>Black turnstone (<i>Arenaria melanocephala</i>)</li> </ul> |
| Marine Mammals  |   |
| <ul style="list-style-type: none"> <li>Dall porpoise (<i>Phocoenoides dalli</i>)</li> <li>Harbor porpoise (<i>Phocoena phocaena</i>)</li> <li>Harbor seal (<i>Phoca vitulina richardsi</i>)</li> <li>Humpback whale (<i>Megaptera novaeangliae</i>)</li> <li>Killer whale (<i>Orcinus orca</i>)</li> <li>Minke whale (<i>Balaenoptera acutorostrata</i>)</li> <li>Pacific white-sided dolphin (<i>Lagenorhynchus obliquidens</i>)</li> <li>Steller's sea lion (<i>Eumetopias jubata</i>)</li> </ul>   |   |
| Fish Species  |   |
| <ul style="list-style-type: none"> <li>Chinook salmon (<i>Oncorhynchus tshawytscha</i>)</li> <li>Chum salmon (<i>Oncorhynchus keta</i>)</li> <li>Coho salmon (<i>Oncorhynchus kisutch</i>)</li> <li>Cutthroat trout (<i>Salmo clarki</i>)</li> <li>Dolly Varden char (<i>Salvelinus malma</i>)</li> <li>Pink salmon (<i>Oncorhynchus gorbuscha</i>)</li> <li>Pacific halibut (<i>Hippoglossus stenolepis</i>)</li> <li>Pacific herring (<i>Clupea pallasii</i>)</li> <li>Sockeye or red salmon (<i>Oncorhynchus nerka</i>)</li> <li>Steelhead/rainbow trout (<i>Oncorhynchus mykiss</i>)</li> <li>Lingcod (<i>Ophiodon elongatus</i>)</li> </ul>  |   |

Adapted from: Ketchikan Gateway Borough Planning Dept. 1994; Heintz and Goucher 2000; Heintz 2000

### 7.2.1 Aquatic Species

#### Marine Mammals

Approximately eight species of marine mammals are commonly found in the Gravina Access Project area. Harbor seals (*Phoca vitulina richardsi*) and Steller sea lions (*Eumetopias jubata*) inhabit Tongass Narrows year round. Additionally, humpback whale (*Megaptera novaeangliae*), killer whale (*Orcinus orca*), dall porpoise (*Phocoenoides dalli*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), minke whale (*Balaenoptera acutorostrata*), and harbor porpoise (*Phocoena phocaena*) travel through the area (Frietag, 2000; City of Ketchikan, 1994). Grey whales are sometimes observed in the area off Vallenar Point; one California elephant seal was seen in Behm Canal.

*Steller Sea Lion.* Annual counts of sea lions between 1985 and 1990 indicated that populations in Tongass Narrows are large and stable (Montgomery Watson, 1994). In Tongass Narrows, sea lions feed on heavy concentrations of herring, crab, and rockfish along the waterfront adjacent to the City of Ketchikan (Ketchikan Gateway Borough, 1994; Freitag, 2000). However, no sea lion haulouts exist in the immediate Ketchikan area (Frietag, 2000).

*Harbor Seal.* Based on three aerial surveys of terrestrial haulouts near Ketchikan, Sitka, and in Glacier Bay, the relatively abundant population of harbor seal in southeastern Alaska appears to be increasing or stable in recent years (Small, 1998). Harbor seals inhabit Tongass Narrows, including the waterfront area adjacent to Ketchikan, year round (Montgomery Watson, 1994). They feed on pelagic and bottom fishes, crustaceans, and octopus (Lowry and Frost, 1981).

#### Anadromous Fish

Fish that spend periods of their lives in fresh and salt water, or anadromous fish, flourish in southeastern Alaska. Lewis Reef Creek, Government Creek, Clam Cove, Hoadley Creek, Ketchikan Creek, Carlanna Creek, and Ward Creek are anadromous streams. All species of salmon, cutthroat and steelhead trout, and Dolly Varden inhabit the project area and provide food for bears, wolves, bald eagles, and other animals. In the project area, anadromous fish are also valuable to commercial, resident, and visiting sport fishers.

Pink salmon spawn in many of the creeks in Tongass Narrows. Adult pink salmon enter spawning streams in the area between late June and mid-October. Most pink salmon spawn within a few kilometers (miles) of the coast or within the intertidal zone of the mouth of streams and die soon afterward. In late winter or spring, the fry swim up out of the gravel and migrate downstream into salt water. Juvenile pink salmon then move along the beaches in dense schools near the surface, feeding on plankton, larval fishes, and occasionally insects (ADF&G, 1999e). In the vicinity of Ketchikan, the Alaska Department of Fish and Game (ADF&G) has counted pink salmon in some area streams on selected days. These counts show the magnitude of the pink salmon populations in Tongass Narrows. ADF&G recorded 6,550 pinks in Ward Creek in August 1998, 180,500 pinks in Ketchikan Creek in September 1996, 490 pinks in Carlanna Creek in September 1979, 2,600 pinks in Hoadley Creek in September 1999, 5,000 pinks in Lewis Reef Creek in August 1983, and 3,000

pinks in Whipple Creek in August 1988 (ADF&G, 2000b). [Note: these fish counts do not represent a “peak” count for the year surveyed, only the number observed on the day of the survey.]

Chum salmon spawn in many of the same places as pink salmon. In the vicinity of Ketchikan, chum salmon spawn from mid-June to mid-November in Government Creek, Ward Creek, Ketchikan Creek, Carlanna Creek, and Lewis Reef Creek. Chums feed on small insects in the streams and estuaries before joining schools in salt water where their diet usually consists of zooplankton. By autumn, they move out to the Gulf of Alaska and spend one to six winters there. In southeastern Alaska, most chum salmon mature at 4 years of age, although considerable variation in age at maturity exists between streams (ADF&G, 1999e). Snapshot counts completed by ADF&G show the importance of chum salmon in the area. The agency recorded 400 chums in the Ward Creek in August 1998, 500 chum in Ketchikan Creek in September 1996, 6 chum in Carlanna Creek in September 1996, and 200 in Lewis Reef Creek in August 1983 (ADF&G 2000b). [Note: these fish counts do not represent a “peak” count for the year surveyed, only the number observed on the day of the survey.]

Coho salmon spawn and rear in most of the longer creeks in the Ketchikan area, and natural runs in Ketchikan and Ward creeks are hatchery-enhanced. Coho enter and spawn in streams from mid-June through mid-November during periods of high runoff. The eggs develop during the winter, hatch in early spring, and the embryos remain in the gravel using the egg yolk until they emerge in May or June. Coho spend one to three winters in project area streams before migrating to the sea as smolt. Time at sea varies. Some males (called jacks) mature and return after only six months at sea at a length of about 12 inches, while most fish stay 18 months before returning as full size adults (ADF&G, 1999e). Snapshot counts show the significance of coho salmon in the project area: 1,000 chum were in Ketchikan Creek in December 1985 and 1,550 were in Ketchikan Creek in September 1983.

Adult Chinook salmon spawn and rear in Ketchikan Creek. Additionally, Deer Mountain Hatchery enhances the Chinook salmon run in the creek. Although total escapement has not been calculated, ADF&G recorded 1,433 Chinook in Ketchikan Creek in September 1983 (ADF&G, 2000e). The fish return to Ketchikan Creek from mid-June through mid-August to spawn. Eggs hatch in late winter or early spring and juveniles remain in fresh water feeding on plankton and insects until the following spring when they migrate to the ocean. Chinook salmon spend one to seven years in the ocean eating a variety of organisms including herring, pilchard, sandlance, squid, and crustaceans.

ADF&G counted approximately 175 sockeye salmon in Ward Creek in October 1988. Sockeye do not spawn or rear in other creeks in the project area. Sockeye return to Ward Creek to spawn in July and August after spending one to four years in the ocean. After hatching, juveniles usually spend one to three years in Ward Lake before migrating to the ocean in the spring.

Steelhead trout (*Salmo gairdneri*) are rainbow trout that spend a part of their life in the sea. According to ADF&G Sport Fish Division snorkel counts, Ketchikan and Vallenar Creeks have steelhead runs of 250 to 500 and 200 to 300 fish, respectively. ADF&G estimates that Ward Creek has runs with approximately 200 steelhead (Hoffman 2000). Bostwick Creek has a steelhead run with unknown numbers. Unlike salmon, steelhead spawn more than once, and fish over 28 inches are almost always repeat spawners. Peak adult steelhead migration into the area creeks occurs in



November and December. Spawning commences in March and adults return the ocean in April and May. Generally, the juvenile steelhead will remain in the parent stream for about one to five years before outmigrating to salt water. Juvenile fish move to salt water in May to mid-July, depending on the watershed (Hoffman, 2000).

Ketchikan Creek has an anadromous cutthroat trout population and Ward Creek has resident and anadromous cutthroat trout populations. Anadromous cutthroat comes into the creek in the fall, overwinter, and sometimes stay through the spring. The juvenile fish hatch from the gravel in February. According to ADF&G, resident fish can reach 46 to 56 cm (18 to 22 inches) at there largest and live to be 18 to 24 years old. The cutthroat fishery primarily is comprised of local fishers and is mainly catch and release (Hoffman, 2000).

ADF&G identifies Dolly Varden populations in Ward Creek. Dolly Varden belong to a group of fish called char. The light spots on their sides distinguish them from most trout and salmon which are usually black spotted or speckled. Dolly Varden spawn in streams, usually during the fall from mid-August to November. Hatching of the eggs may occur in March and emergence usually occurs in April or May. Most Dolly Varden migrate to sea in their third or fourth year, but some wait as long as their sixth year. After their first seaward migration, Dolly Varden usually spend the rest of their lives wintering in and migrating to and from fresh water. At maturity, Dolly Varden return to spawn in the stream from which they originated. Specific information on Dolly Varden populations in Ward Creek is not available.

The Deer Mountain Hatchery raises and releases anadromous fish into Ketchikan Creek and Ward Lake. Table 7-2 shows the numbers of fish released into Borough waterways from these hatcheries.

**Table 7-2. Fishery Enhancement Activities in the Ketchikan Area**

| Release Location       | Species         | Number Released |
|------------------------|-----------------|-----------------|
| Deer Mountain Hatchery |                 |                 |
| Ketchikan Creek        | Chinook salmon  | 100,000*        |
| Ketchikan Creek        | Coho salmon     | 75,000*         |
| Ward Lake              | Coho salmon     | 75,000*         |
| Ketchikan Creek        | Steelhead trout | 79,000*         |

\*1999 estimates of numbers of fish released.

Source: Guthrey 2000

## **Marine Fish**

While southeastern Alaska rivers and streams have relatively few species of resident fish, marine waters contain hundreds of fish species. Flatfish, cod, rockfish, sculpin, halibut, skate, and sablefish are abundant in the marine waters throughout southeastern Alaska. Additionally, huge schools of herring, smelt, capelin, and pacific sand lance collectively provide the food base for salmon, trout, and char (O'Clair et al., 1997). Other marine fish species that live in the marine waters of the Gravina Access Project area include yelloweye rockfish, shortracker, roughey rockfish, dusky rockfish, walleye pollock, lingcod, Pacific Ocean perch, arrowtooth flounder, Pacific cod, skates, and sculpin (Shaw, 1999). The following paragraphs describe the marine fish identified by ADF&G and

the National Marine Fisheries Service (NMFS) as important in the Gravina Access Project area; i.e., Pacific herring and Pacific halibut.

Pacific herring (*Clupea pallasii*) and their eggs are important food sources for a wide variety of fishes, mammals, and birds. Additionally, humans harvest herring eggs for consumption (commercial and subsistence). Herring spawn during the spring in eelgrass or *Fucus* beds at the north end of Gravina Island (Ketchikan Gateway Borough, 1994; Heintz, 2000). The West Behm herring, at ages three to seven years, spawn on or around the area north of Gravina Island from South Vallenar Point to Rosa Reef throughout the month of April (Walker, 2000).

Pacific halibut (*Hippoglossus stenolepis*) inhabit marine waters of the project area. Based on sport fishing catch information, most halibut in the Ketchikan area measure 65 to 105 centimeters (cm) (26 to 41 inches) and weigh between 7 to 11 kilograms (15 and 24 pounds (ADF&G, 1999b). Halibut eat a large variety of fishes, including cod, turbot, pollock, and some invertebrates such as crab and shrimp, and sometimes leave the ocean bottom to feed on pelagic fish, such as sand lance and herring. The fish spawn in the winter months. Free-floating eggs and larvae float for up to six months until they are carried to shallower waters by prevailing currents to begin life as bottom dwellers. Older fish often use both shallow and deep waters over the annual cycle; however, they have much smaller “home ranges” than halibut younger than 10 years (ADF&G, 1999e).

### 7.2.2 Amphibians

Most amphibians in southeastern Alaska occur on the mainland within major river valleys; however, two species are assumed to inhabit the project area. Rough-skinned newt and the western toad have been observed on Annette Island and on Gravina Island (Brown, 2000; Reich, 2000a).

The rough-skinned newt salamander (*Taricha granulosa*) is reported to range on the Pacific coast of North America from northern California to southern southeastern Alaska. The newts are common on Annette Island in creeks and wet areas (Wake, 1998) and were observed in the Mahoney Lake Hydroelectric Project area on Revilla Island in 1995 (HDR, Inc., 1995). Rough-skinned newts have a mean total length of 12 cm (5 in) and width of 1.2 cm (.5 in). The species is characterized by having dark blotching on its dorsal side.

The western or boreal toad (*Bufo boreas*) is common in southeastern Alaska and has been seen at night on roads in disturbed areas on Annette Island (Wake, 1998). The toad is characterized by rough, warty skin with glands that secrete a fluid to discourage predation. Adult toads may reach a length of approximately 9 cm (3.5 inches). They breed in freshwater wetlands and move to terrestrial, non-forested areas to feed on insects and other small animals during adulthood (ADF&G, 1999).

### 7.2.3 Birds

More than 300 bird species spend some period of time in southeastern Alaska, and 160 species nest in or near Ketchikan (O’Clair et al, 1997). Around Revilla and Gravina islands and the surrounding waters, local bird watchers and naturalists have observed approximately 225 species of birds (Heintz and Goucher, 2000). In the Gravina Access Project area, birds dwell in a variety of habitats including marine waters, freshwater wetlands, and forests.

Numerous species forage in the rocky intertidal habitat of Tongass Narrows. Waterfowl, including oldsquaw, bufflehead (*Bucephala islandica*), common goldeneye (*Bucephala clangula*), Barrow's goldeneye (*Bucephala islandica*), harlequin duck (*Histrionicus histrionicus*), white-winged scoter (*Melanitta fusca*), surf scoter (*Melanitta perspicillata*), common merganser (*Mergus merganser*), and red-breasted merganser (*Mergus serrator*), forage in the rocky intertidal zone of Tongass Narrows during high tide (O'Clair and O'Clair, 1998; Heinl, 2000). They primarily feed on invertebrates and small fish in the ice-free waters along the coastline during the winter and breed in more northern areas of Alaska during the summer. Other species, primarily gulls, northwestern crows (*Corvus caurinus*), and common ravens (*Corvus corax*), feed on invertebrates and opportunistically scavenge in the rocky intertidal areas during low tide. In the early spring, surf scoters and gulls, along with other species, gather and feed upon herring spawn on eelgrass and *Fucus*. Popular feeding areas include the Totem Bight area and the north end of Gravina Island. Gulls follow herring as they move northward along the coastline (Heinl, 2000).

Some migratory waterfowl and summer seabirds concentrate just north of Pennock Island adjacent to downtown Ketchikan and at the head of Ward Cove (Ketchikan Gateway Borough, 1994). Shorebird species, including western sandpipers (*Calidris mauri*) and red-necked phalarope (*Phalaropus fulicaria*), feed and stage in estuarine areas within the project area during the spring and fall migrations. However, larger estuaries outside the project area on Gravina Island provide more important habitat to birds migrating northward (Heinl, 2000). Since most seabirds feed and nest near the open ocean, seabird colonies do not exist within the planning area (Brockman, 2000; Brown, 2000; Heinl, 2000; USFWS, 2000).

Rock doves (*Columba livia*), chestnut-backed chickadees (*Parus rufescens*), winter wren (*Troglodytes troglodytes*), and varied thrush (*Ixoreus naevius*) breed and inhabit forested areas of the project area year round. Other passerines, including Swainson's thrush (*Catharus ustulatus*), orange-crowned warbler (*Vermivora celata*), and Townsend's warblers (*Dendroica townsendi*), breed in the area forests in the summer. American robin (*Turdus migratorius*), dark-eyed junco (*Junco hyemalis*), kinglet (*Regulus* spp.) Steller jay (*Cyanocitta stelleri*), and several warblers (family Emberizidae) use beach-fringe forests and scrub-shrub communities. Greater yellowlegs (*Tringa melanoleuca*) may nest in the freshwater fens (Nickles 1997).

The Audubon Christmas Bird Count identified 53 bald eagles in the Ketchikan area in December 1999. Likely due to their protection under the Bald Eagle Protection Act of 1940 (as amended), the bald eagle (*Haliaeetus leucocephalus*) population in southeastern Alaska is stable (Ketchikan Gateway Borough, 1994).

#### 7.2.4 Land Mammals

Approximately 50 species of terrestrial mammals inhabit the U.S. Forest Service's (USFS's) Tongass National Forest and most of southeastern Alaska (USFS, 1997). Many of those species are found within the Gravina Access Project area. Ubiquitous species, including Sitka black-tailed deer, black bear, mink, beaver, and river otters contend with heavy rains, deep winter snows, geographical barriers such as mountains, larger rivers, and wide marine channels that limit the distribution of terrestrial mammals in southeastern Alaska. They feed and breed in coastal rain forests, salt and



freshwater wetlands, and alpine areas. While much information exists on larger land mammals, the exact distribution and numbers of many small mammals remains unknown.

The U.S. Fish and Wildlife Service and ADF&G identify Sitka black-tailed deer, Alexander Archipelago wolf, and black bear as important common species in the area. The following paragraphs give detailed information on these species and their habitats.

*Sitka Black-tailed Deer.* The Sitka black-tailed deer (*Odocoileus hemionus sitkensis*) is native to wet coastal rain forests of southeastern Alaska and north-coastal British Columbia. Deer populations in Alaska are dynamic and usually fluctuate with the severity of the winters. Periodically, a severe winter will cause a major decline in the population (Ketchikan Gateway Borough, 1994). However, unlike other areas in Alaska, the Ketchikan area rarely experiences severe winters resulting in high winter deer mortality (Person, 2000). Since the 1980s, deer populations on Gravina Island have fluctuated between 350 and 915. Based on pellet group density counts and reports from hunters, the deer population inhabiting Gravina Island and southern Revilla Island is estimated to be approximately 14 to 43 deer per 2.59 square km (1 square mile) (ADF&G, 1998a).

Critical habitat for deer is winter habitat. Winter habitat includes south and west-facing slopes not exceeding 244 meters (800 ft) and high volume timber stands (Person, 2000). In the winter, they eat evergreen forbs and woody browse. During periods of deep snow [greater than 30 cm (12 in)], deer rely on understory vegetation species including woody browse such as *Vaccinium* sp. (blueberry), evergreen forbs (like bunchberry and golden thread), yellow cedar, hemlock, and arboreal lichens. Often deer will move to the shoreline to feed on grasses and sedges (ADF&G, 1999a). Deer may feed on *Fucus* and kelp, however, the animals receive little nutritional value from the algae. Evergreen forbs such as bunchberry and trailing bramble are the preferred food for deer when snow is not a problem. During summer, deer generally feed on herbaceous vegetation and the green leaves of shrubs away from the coastline.

The deer population on Gravina Island provides food for wolves and bear. Additionally, because of the proximity to Ketchikan, Gravina Island is a popular deer hunting area for humans. People access Gravina Island by boat or the airport ferry and travel around the island on foot. The middle of the Island provides a refuge for deer from human hunters, since it is a long and difficult way to travel from the beach landings (Person, 2000). The ADF&G manages deer hunting on Gravina Island, and assumes the residing population size is healthy (ADF&G, 1998a)

*Alexander Archipelago Wolf.* In southeastern Alaska, the wolf population varies closely with Sitka black-tailed deer. The wolves were petitioned for the federal list of threatened and endangered species as an endangered species in 1994. However, due to changes in forest harvest management and practices in the Tongass National Forest, the U.S. Fish and Wildlife Service denied the petition (ADF&G, 1999c; Brown, 2000; Grossman, 2000; Person, 2000).

According to the ADF&G, one pack of Alexander Archipelago wolf (*Canis lupus*) with 10 to 12 individuals inhabited Gravina Island in the fall of 1999, and approximately four wolves were shot or trapped during the following season (Person, 2000). The ADF&G does not know whether the pack is restricted to Gravina Island or whether these wolves travel to Revilla Island. Deer comprise 80 percent of the diet of wolves on Gravina Island, and the wolf pack is healthy because of the stable

deer population. The wolves also feed on beaver (15 to 20 percent of their diet), salmon, and occasionally scavenge or hunt marine mammals (Person, 2000). They use a variety of habitats, including open wetlands and forests to hunt. Areas inhabited by their prey species are critical to the wolves' survival. Southeastern Alaska's wolf populations may be vulnerable to access and road development (Person, 2000; Grossman, 2000).

*Black Bear.* The population of black bear (*Ursus americanus*) in the Ketchikan Gateway Borough is approximately 1.5 black bear per 2.59 km<sup>2</sup> (1 square mile) (ADF&G, 1995). Black bears mainly inhabit forests but, depending on the season of the year, they may live in areas from sea level to alpine. Black bears are opportunist feeders that feed on freshly sprouted green vegetation in the spring and salmon during the summer and fall. Berries, especially blueberries, are an important late summer-fall food item. Black bears hibernate during the winter months in rock cavities, hollow trees, and self-made excavations located from sea level to alpine (ADF&G, 1999e).

The ADF&G commonly relocates black bears from locations in the Ketchikan Gateway Borough to other areas in southern southeastern Alaska because of problems with human-bear interactions (Porter, 2000). Humans hunt black bear on Gravina and Revilla islands. Based on hunter reports, an average of 66 bears per season was harvested from 1984 through 1992 and 43 bears per season were harvested from 1993 through 1995. ADF&G believes that early forest successional changes caused by logging may increase food for bears in the short-term. However, the agency anticipates reductions in bear numbers as later forest growth results in less food and fewer places for bear to den (ADF&G, 1995).

### 7.3 Protected Species

Currently, the USFWS asserts that there are no listed species under their jurisdiction in the Gravina Access Project area (Woods, 2000). The NMFS lists two species found in the Borough as endangered: Steller sea lion (*Eumetopias jubatus*) and humpback whale (*Megaptera novaeangliae*). Both species are additionally protected under the Marine Mammal Act of 1972.

The largest Steller sea lion rookery in the world is found in southeastern Alaska on Forrester Island. The Stellar sea lions use approximately 50 haulout sites scattered throughout the coast of southeastern Alaska (MacDonald and Cook, 1999), including one on Grindall Island on the southwest side of Clarence Strait. North Pacific humpback whales were listed as endangered in 1966. It is estimated that 15,000 humpback whales inhabited the North Pacific prior to mechanized commercial whaling. Today, scientists estimate approximately 2,000 humpback whales in existence. More than 500 humpback whales inhabit the marine waters near Southeast Alaska during the summer (MacDonald and Cook, 1999). Humpback whales commonly feed throughout the marine waters near the project area.

In addition to the federally listed species, the State of Alaska has listed the American peregrine falcon, northern goshawk, and harbor seal as species of special concern (see Table 7-3).

**Table 7-3. Federal and State listed threatened, endangered, and species of special concern that may be found in the Borough.**

|                           | <b>Federal</b>     | <b>State</b>               |
|---------------------------|--------------------|----------------------------|
| Humpback whale            | Endangered Species | Endangered Species         |
| Steller sea lion          | Endangered Species | Species of Special Concern |
| American peregrine falcon |                    | Species of Special Concern |
| Northern goshawk          |                    | Species of Special Concern |
| Harbor seal               |                    | Species of Special Concern |

Source: Alaska Department of Fish and Game. State of Alaska Endangered Species List. State of Alaska Species of Special Concern as of January 21, 2000; U.S. Fish and Wildlife Service Division of Endangered Species U.S. Listed Vertebrate Animal Species Index by Lead Region and Status as of January 31, 2000; personal communication with ADF&G, USFWS, NMFS, and USFS personnel.

## 8.0 Historic and Archaeological Resources

The Alaska Heritage Resources Survey (AHRS) lists approximately 250 archeological and historical properties in the project area. The vast majority of these are historic buildings concentrated in Ketchikan. Other recorded sites in Ketchikan include a former city garbage dump (KET-435), two totem sites, a burial locale, and culturally modified trees on the U.S. Coast Guard base. There are five recorded properties in Saxman, including two petroglyph sites (one with canoe runs), a totem park, the Alaska Native Brotherhood Hall, and a clanhouse.

Nineteen properties in Ketchikan and Saxman are listed on the National Register of Historic Places, and another 30 have been determined eligible for the Register. Among these are the Headquarters Building of the 16th Lighthouse District (KET-279) and the Coast Guard Supply Warehouse (KET-356) in Ketchikan, and the Chief Kashakes House in Saxman. The latter, built in 1889, is associated with two totem poles and three burials.

On Pennock Island, opposite Saxman, there is a late nineteenth and early twentieth century cemetery (49-KET-055) (Sealaska Corporation, 1975:106). This was originally a burial ground of the Saxman Tlingits with grave houses and commemorative totems, although it was also used by the people of Ketchikan (Roppel, 1998:8).

On Revilla Island, northwest of Ketchikan, there is the Ward Cove Packing Company (KET-292) and the Refuge Cove site (KET-303). The Ward Cove Packing Company, originally the Walsh Moore Canning Company, was built in 1912 (Roppel, 1998:220-221). The Refuge Cove site is a small shell midden that was occupied about 800 to 1,500 years ago.

The Port Gravina site (KET-027), on Gravina Island at the northern end of the Ketchikan airport runway, was established in 1893 by a group of Tsimshians from Metlakatla who had attended the Sitka Industrial Training School (Roppel, 1998:226). Originally consisting of a sawmill, residences, a store, a government school, and a church, Port Gravina was the first business to be built, managed, and operated entirely by Alaskan Natives. The village was sited along the waterfront "with one street leading to the store, dock, and sawmill at the north end" (Roppel, 1998:226). The settlement was abandoned after the sawmill and more than half of the other buildings were destroyed by fire in 1904 (Roppel, 1998:227).

Although ethnographic accounts mention a number of localities used by the Tlingit in the Ketchikan area, only three prehistoric archaeological sites have been officially recorded on the AHRS. However, as mentioned previously, much of the project area has not been intensively inventoried, and the possibility of locating additional sites should not be ruled out. The few known prehistoric sites in the project area—such as the Refuge Cove site and petroglyph sites in Saxman—are all along the coast.

In addition to the properties listed in the AHRS, there are numerous historic sites along the shores of Tongass Narrows mentioned in *Land of Mists...*, Patricia Roppel's (1998) geographical and historical guide to Revilla and Gravina islands. Roppel only occasionally mentions the condition of any remains at these sites, although her narrative does give a sense of the intensity of historic settlement in the region.

Ward Cove was used by the U.S. Coast & Geodetic Survey as an anchorage during survey trips in the area in the late 1880s (Roppel, 1998:218). By 1898, there was a small village on the western side of the cove including a wharf, a store, a post office, and "a few dwellings." Several salteries were built in the cove during the late 1890s and early 1900s. At the head of the bay, "on the west point of the entrance to what is now called Ward Creek," was the Revilla Island sawmill (Roppel, 1998:219). Opposite the sawmill, Eugene Wacker, who homesteaded in Ward Cove in 1910, platted a townsite. Wacker, as the settlement was called, had a school and post office, although several attempts to incorporate it as a second class city failed. Ketchikan Pulp Company purchased the town and built much of its plant on the site (Roppel, 1998:221).

On Charcoal Point, which was ultimately incorporated in the Ketchikan's waterfront, there was an arrastre<sup>2</sup> to grind ore from nearby gold claims. In 1904, Davis and Son had a boatyard at the point. A Marconi wireless station, a shipyard, and a cannery were built there in the 1910s and early 1920s.

North Saxman, also called Port Dundas, was a small settlement on a point approximately 0.61 km (0.38 miles) northwest of Saxman. The Verney Brothers Lumber Company built a steam sawmill there in 1900 and owned practically all of the town's buildings (Roppel, 1998:11).

The earliest farm on Gravina Island was apparently settled by F.H. Fedler in 1907 (Roppel, 1998:7), although the largest settlement on the western channel of Tongass Narrows was at Clam Cove. Antone Stensland homesteaded there in 1913, and in 1914 the U.S. Forest Service built a boathouse and shipyard. This marine station, which included a one-room school and several houses, operated until about 1950 (Roppel, 1998:6-7). The U.S. Coast and Geodetic Survey constructed a boat house and wharf in East Clump bight in 1921 (Roppel, 1998:227). The Goldstream mine, claimed around 1900, was on the southern end of Gravina Island (Roppel, 1998:12). There were two other groups of claims approximately 0.4 km (0.25 miles) south of the Goldstream mine, where exploratory work took place prior to 1908. Here, there are reportedly the remains of an ore mill (Roppel, 1998:13).

Dan Whipple homesteaded on Gravina Island in 1910, but in 1919 he moved to a homesite on the northern end of Pennock Island (Roppel, 1998:213). Fred Borg built a house and a small boathouse on the northern end of Pennock Island in 1903. Heckman and Company had a storehouse on the island in 1908 (Roppel, 1998:8). In Whisky Cove, opposite the U.S. Coast Guard base, there were two boathouses and a machine shop dating from the late 1910s or early 1920s. Erik Forss also had a ranch at the cove (Roppel, 1998:9). In Radenbough Cove, there was a shipyard built by Charles Radenbough sometime before 1911, as well as cabins, wharves, and docks (Roppel, 1998:9). Snow Island, at the northwestern end of Pennock island, was the home of Major Ray Snow, who settled there in 1926 (Roppel, 1998:8).

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<sup>2</sup> An arrastre is a fixed round iron pan, about 12 feet in diameter, in the center of which works a vertical axle, from which extend two or more arms; and fastened by chains to these arms are two or more blocks of granite.

## **9.0 Visual Environment**

The visual environment of the project area is dominated by the natural features of Tongass Narrows and the steep mountain slopes characterizing the surrounding land masses. The lush forests, rivers, lakes, and marine habitat enhance the scenery and create recreation and sightseeing opportunities for tourists and residents of Ketchikan. Views from Ketchikan are primarily over-water views toward nearby forested, mountainous islands. Waterfront areas are popular for wildlife viewing, picnicking, hiking/walking, and sightseeing. The U.S. Forest Service completed a survey in 1992 that determined “viewing scenery” was the most popular activity among visitors on National Forest lands in the Ketchikan region. During the summer tourist season, increases in shipping and floatplane activity in Tongass Narrows create a perception of human dominance in the viewshed.

The City of Ketchikan is dominated by a commercial/industrial waterfront, a centralized business district with small multistory buildings, and hillside residential areas. Most structures on land are small- to medium-scale buildings. Cruise ships in the downtown harbor area add a large visual element to the visual environment.

Natural features primarily dominate views of Gravina and Pennock islands from Ketchikan. With the exception of the airport and timber processing plant just north of the airport, Gravina Island is mostly undeveloped along Tongass Narrows. Pennock Island is developed only along its waterfront and this development primarily consists of small residential structures with docks and watercraft.

## 10.0 Transportation

There are numerous modes of transportation in the project area, the most popular being motor vehicle, aircraft, and watercraft. Given its location and surrounding geography, transportation in the project area is more water- and air-based than land-based, with Tongass Narrows providing a major transportation corridor for both water and air travel.

Tongass Narrows is approximately 21 km (13 miles) in length stretching from Nichols Passage to Guard Island. At its narrowest point, Tongass Narrows is less than a half a kilometer (no wider than one quarter of a mile). Steep mountains rising over 609 meters (2,000 feet) bound this narrow passage on the east and west. These natural features create a funnel effect that requires aircraft and sea-going vessels to operate in proximity.

Each summer, over 480 cruise ships dock in Ketchikan, bringing over 300,000 visitors annually. Additionally, four canneries, three cold storage facilities, a single fish processing plant, and 438 area residents holding commercial fishing permits support Ketchikan's summer fishing industry. According to the *Tongass Narrows Voluntary Waterway Guide*, "a typical summer day in Tongass Narrows may result in 500+ floatplane landings and takeoffs; 173 charter boat transits; 22 small passenger vessels; 4 to 6 large cruise ships with 1 to 2 at anchor; 150 fishing vessels at 7 canneries; 3 to 5 barge/tug transits; 30 to 40 kayaks; and an unknown number of recreational and transient boat traffic."

The following paragraphs describe the major modes of transportation in the project area.

### 10.1 Aviation

Four public aviation facilities exist within Tongass Narrows: Ketchikan International Airport, Ketchikan Harbor Seaplane Base, Murphy's Pullout Seaplane Base, and Peninsula Point Seaplane Base. Numerous small private floatplane facilities and heliports also operate in the Narrows. Air traffic can exceed 100,000 operations annually, the majority of which occurs during the summer months at the height of the fishing and tourism season.

In combination, these elements create a greatly constricted and highly active channel. As a result, aviation and vessel activity in Tongass Narrows is specially regulated under Federal Aviation Regulations and the Code of Federal Regulations. Additionally, the U.S. Department of Transportation and the U.S. Coast Guard have prepared documents recommending guidelines for the safe operation of aircraft and sea-going vessels in this area.

Ketchikan International Airport is the primary air hub in southern/southeastern Alaska, serving the City of Ketchikan as well as nearby communities such as Metlakatla, Klawock, and Craig. The airport occupies approximately 1,088 hectares (2,689 acres) on Gravina Island. The DOT&PF owns the airport and the Ketchikan Gateway Borough operates and maintains the airport through a long-term lease. The Alaska Aviation System Plan classifies the airport as a Regional Center Airport. It serves air carrier, commercial, general aviation, cargo, and military air traffic. Ketchikan International Airport provides shuttle ferry service transporting passengers and vehicles to and from the airport.



Floatplane aircraft are currently accommodated on Tongass Narrows at two airport facilities toward the west end of airport runway 11/29. One facility provides three transient docking spaces at a cost of five dollars per day. The other facility, according to the airport manager, is the largest floatplane dock in southeastern Alaska, with a dock that can accommodate up to 12 Twin Otter aircraft at a time and is used for the loading and unloading of passengers and freight. Additionally, a concrete ramp is located in the area to facilitate removal of floatplanes for maintenance or storage. According to the airport manager, floatplane operations average approximately 7,000 take-offs and landings annually (Chenall, 1999).

Southeast of the Ketchikan International Airport within Tongass Narrows, lies the Ketchikan Harbor Seaplane Base. This public domain facility consists of a 3,050 meter x 455 meter (10,000-foot x 1,500-foot) water runway oriented northwest to southeast on the north side of Tongass Narrows adjacent to Ketchikan and numerous privately owned, air taxi floatplane docking facilities. The runway is open to public floatplane use but does not provide public or transient seaplane docking facilities. The Ketchikan Harbor Seaplane Base averages approximately 240 operations per day, which are nearly ten times the operations conducted at the floatplane base at Ketchikan International Airport. According to the Federal Aviation Administration's Airport Master Record (FAA 5010), 85 percent of the operations from this facility are conducted by air taxi aircraft.

Owned by the Ketchikan Gateway Borough and managed by the state, Murphy's Pullout is located 8 km (5 miles) northwest of the City of Ketchikan. This facility consists of a 3,050 m by 455 m (10,000 feet by 2,000 feet) water runway oriented northeast to southwest on the north side of Tongass Narrows in the vicinity of Ward Cove. This facility provides eight spaces for transient floatplane aircraft. According to Ketchikan Flight Service Station personnel, few operations (approximately 700 annually) occur at this facility (McDonald, August 1999).

The Peninsula Point Seaplane Base has been abandoned for nearly 10 years and is not currently maintained for aircraft use. This facility comprises a concrete ramp and one hangar. Rocks and debris at the entrance to this facility impede floatplane operations. Taquan Air leases space at Peninsula Point for aircraft storage. Temsco Heliport is a privately owned heliport that operates northeast of this facility (Chenhall, August 1999).

Alpine Helicopters Inc. is a privately owned heliport and is located on Revilla Island approximately 5 km (3 miles north) of the Airport Ferry terminal.

Table 10-1 presents operation records, capacity, and aircraft type accommodated at each public aviation facility in the project area.



**Table 10-1. Aviation Facility Characteristics**

| Facility                                   | Operations/Year                | Aircraft Type | Aircraft Spaces             |
|--|--------------------------------|---------------|-----------------------------|
| Ketchikan International Airport            | 16,208 <sup>1</sup>            | Fixed Wheel   | 2 air carrier<br>2 air taxi |
|  | 7,000 <sup>2</sup>             | Floatplane    | 12 transient GA*<br>1 cargo |
| Ketchikan Harbor Seaplane Base             | 88,000 to 100,000 <sup>6</sup> | Floatplane    | 0                           |
| Murphy's Pullout Seaplane Base             | 100 to 200 <sup>6</sup>        | Floatplane    | 8 (transient)               |
| Peninsula Point Seaplane Base <sup>3</sup> | 0                              | Floatplane    | 0                           |
| Temsco Helicopters Inc. <sup>4</sup>       | Summer 20 per day              | Helicopter    | 20                          |
|  | Winter 6 per day               |               |                             |
| Alpine Helicopters Inc. <sup>5</sup>       | Summer 200 Per month           | Helicopter    | 3                           |
|  | Winter 0-100 per month         |               |                             |

\* GA= General Aviation

<sup>1</sup> Total operations for 1998. FAA, Terminal Area Forecast.

<sup>2</sup> Floatplane only operation data for this facility is not reported in the FAA Terminal Area Forecast (TAF). (Chenhall, 1999)

<sup>3</sup> This facility has been abandoned.

<sup>4</sup> (Hicks, 1999)

<sup>5</sup> (Bockmen 1999)

<sup>6</sup> (McDonald, 1999)

Numerous private floatplane charter businesses operate along the waterfront of Ketchikan. Some operators (Taquan Air) have built large docks to accommodate a substantial number of floatplanes while the majority of these businesses use one or two plane docks. Though the majority of these businesses operate from the Ketchikan Harbor area, a few operators have businesses beyond its boundaries.

Aircraft departing or arriving from any of the above facilities and transient aircraft passing through the Tongass Narrows area are required to operate with 3 statute miles of visibility and 152 meters (500 feet) below, 305 meters (1,000 feet) above, and 610 meters (2,000 feet) horizontal minimum distances from clouds. When approaching to land at Ketchikan International Airport, an altitude of at least 270 meters (900 feet) MSL must be sustained until within 4.8 km (3 miles) of the airport. After takeoff from Ketchikan International Airport, the pilot must maintain runway heading until reaching an altitude of 270 meters (900 feet) MSL.

Floatplanes routinely use Tongass Narrows for takeoff and landing procedures at the three seaplane bases in the project area. During inclement weather, exempt commercial operators flying under special authorization frequently fly at altitudes ranging from 60 meters to 90 meters (200 feet to 300 feet) (McDonald, 1999). Considering the frequency of inclement weather and accompanying authorization of special operations, the potential for floatplane aircraft initiating an arrival at or below an altitude of 152 meters (500 feet) MSL is considerable.

## 10.2 Marine Navigation

The largest vessels routinely making use of Tongass Narrows are cruise ships that visit seasonally at Ketchikan, primarily from May through September. Most of the large cruise ships operating in Alaska operate from Vancouver, British Columbia. As a result, nearly all of the large cruise ships stopping at Ketchikan pass under the Lions Gate Bridge and/or the Seymour Narrows power cable

crossing, depending on the route the cruise ships take. The vertical clearance of the Lions Gate Bridge is 60 meters (200 feet) and the vertical clearance of the Seymour Narrows power cable is currently 55 meters (180 feet).

The Alaska Marine Highway System operates five mainline and two feeder vehicle/passenger ferries in southeastern Alaska. The DOT&PF *Southeast Alaska Transportation Plan* (March 1999) calls for major changes in the way public ferry services are delivered in southeastern Alaska. When implemented, the Plan will result in reduced port calls throughout southeastern Alaska by existing large “mainline” vessels as well as daily service from new smaller vessels providing regional, community, or shuttle services as defined in the Plan.

The airport ferry service provides a primary mode of access for vehicles, bicyclists, and pedestrians bound to and from the airport. The ferry runs between Revilla and Gravina islands every half-hour in the off season, and every 15 minutes during the busy summer months. When two air carrier planes are active, usually during the summer months, the ferry can exceed capacity (Ketchikan International Airport Master Plan Update). Currently, the airport operates two ferries, with a replacement ferry currently under construction. The ferry terminal on Revilla Island is located about 4 km (2.5 miles) northwest of downtown Ketchikan directly opposite of the terminal on Gravina.

The U.S. Coast Guard operates from its base located between Ketchikan and Saxman on Revilla Island. Three cutters operate from this base. There are no known significant U.S. Navy operations in Tongass Narrows. However, the U.S. Coast Guard base is designated as an emergency port facility for submarines using the Back Island acoustic range on Behm Canal.

Pennock Island divides Tongass Narrows into the east and west channels. Both channels can be navigated by vessels of any draft. Cruise ships bound for Ketchikan usually use the east channel because it aligns better with the cruise ship docks. Vessels of the Alaska Marine Highway System and barges tend to use the west channel to avoid cruise ship traffic and because there is less shoreline development along the west Channel, and hence less concern regarding wake.

The Ketchikan area has seven small boat harbors. There are a few docks and moorages located along the coastline of Gravina Island, including at the airport, at the timber processing plant just north of the airport, and at private residences.

A large number of kayaks use the waters of Tongass Narrows. During the summer tourist season several outfitters/guide operations offer kayak excursions originating in Ketchikan. In addition, local residents also kayak on the Narrows.

Personal watercraft includes vessels such as jet skis. The Ketchikan harbormaster has indicated that few personal watercraft operate there (i.e., “less than 10”), but some personal watercraft operate from Knudsen Cove and south of town.

### **10.3 Local Roadways and Motor Vehicle Transportation**

The existing road system on Revilla Island is limited to downtown Ketchikan and the more populated surrounding areas. Tongass Avenue, which becomes Tongass Highway outside of the City

of Ketchikan, is the most traveled road on Revilla Island and Ketchikan's sole thoroughfare. Tongass Avenue is a two- to three-lane city street with on-street parking, selected left lane turns, traffic signals at two intersections, and sidewalks. Work, schools, shops, residential and recreation areas are primarily accessed via Tongass Avenue. Traffic and congestion is a prominent problem on Tongass Avenue. According to the Tongass Avenue Improvements Environmental Assessment (DOT&PF, 1995), the traffic volume in Ketchikan is continuing to increase. The signalized intersection at Jefferson and Dock streets, left-turns onto Carlanna Lake Road and Third Avenue, and Washington Street and Schoenbar Road intersections with Tongass Avenue are all heavily used, problem intersections, especially during the summer months (DOT&PF, 1995)

the Tongass Avenue Improvements Environmental Assessment (DOT&PF, 1995) includes a plan to pave and restripe Tongass Avenue, repair and/or replace two Tongass Avenue viaducts, and extend Third Avenue to Schoenbar Road to improve traffic capacity. Beginning near the airport ferry terminal and ending at the intersection with Deermount Street, this project will alleviate traffic congestion, address safety concerns, and replace or repair two viaducts on Tongass Avenue that have deteriorated due to corrosion.

Public transportation is available in Ketchikan via a city bus system. The bus route begins at the airport ferry terminal parking lot and runs downtown and through the neighborhoods of Ketchikan. The bus operates Monday through Saturday beginning at 5:15 a.m. and runs approximately every 30 minutes. On Sundays, the bus operates less frequently.

There are no public roads on Gravina Island. A private access road for the timber processing plant runs north from the airport to the plant. With the exception of employees traveling to the timber processing plant north of the airport, vehicles transported to the airport on the ferry stay on the airport property while on Gravina Island.

#### **10.4 Pedestrians and Bicyclists**

The majority of pedestrians in the project area are found in the downtown area mainly around the cruise ship docks or travelling from parked cars to a particular destination. Conflicts between vehicles and pedestrians mainly occur at street crossings. The limited sidewalk space sways pedestrians to spill out into the street, which is an issue in some locations.

Currently bicycle usage on Ketchikan is minimal. During the summer, riders include travelers passing through Ketchikan on the ferry who bring bikes for sightseeing and recreation. Ketchikan Gateway Borough and the City of Ketchikan advocate a plan (the *Comprehensive Pedestrian and Bikeway Plan*) to develop bike trails and lanes. The first priority of the plan is to establish an alternative bicycle/pedestrian connector through Ketchikan.

## 11.0 Hazardous Waste Sites

The ADEC (1999) has identified nine contaminated sites in the Gravina Access Project area. Most sites are contaminated with diesel associated with spills and leaky above- and below-ground storage tanks. Three sites are under active remediation, and the remaining listed sites are of unknown status or are not under active cleanup. Table 11-1 identifies the nine contaminated sites.

**Table 11-1. Known contaminated sites, location, problem and status.**

| Site Name                          | General Location                       | Problem  | Status of Cleanup    |
|------------------------------------|--|--|----------------------|
| KPC Ward Cove Pulp Mill            | Mile 7.5 N. Tongass Hwy.               | *  | Active               |
| Ketchikan Coast Guard Firing Range | 1300 Stedman St.                       | Active firing range from 1960-1995. TCLP and lead in soil. | Site intake (Active) |
| Yellow Taxi-Sourdough Cab          | 531 Deermont St.                       | Not available  | Unknown              |
| Ketchikan General Hospital         | 3100 Tongass Ave.                      | Underground storage tanks that have spilled.               | Inactive             |
| Ketchikan Federal Scout Armory     | 645 Jackson St.                        | Petroleum contamination in soil                            | Inactive             |
| Bailey Power Plant                 | Tongass Avenue near airport ferry dock | Diesel contamination in soil                               | Unknown              |
| Coast Guard Base Property          | Mile 1 S. Tongass Hwy.                 | Soil petroleum contamination                               | Active               |
| Ketchikan Tank Farm                | Mile 4 Stedman St.                     | Soil petroleum contamination                               | Inactive             |
| Herring Bay Lumber Co.             | 8219 S. Tongass Hwy.                   | Soil diesel contamination                                  | Inactive             |

\* See explanation in the following paragraph.

Source: Alaska Department of Environmental Conservation. 2000. Contaminated Sites Database.

The Ketchikan Pulp Company Ward Cove Mill, located 8 km (5 miles) north of Ketchikan on the north shore of Ward Cove, is polluted with numerous chemical and metals from timber mill operations, including arsenic, lead, manganese, polycyclic aromatic hydrocarbons, dioxins, PCBs, and petroleum hydrocarbons. Side-scan-sonar data show 500 logs per 10,000m<sup>2</sup> (2.5 acres) in the center of Ward Cove and 100 logs per 10,000 m<sup>2</sup> (2.5 acres) near the mouth of Ward Cove (Exponent 1999). Ward Cove is on the state's impaired waterbody list for sediment toxicity, dissolved oxygen, and residue. The ADEC is presently preparing a Ward Cove waterbody recovery plan to establish thresholds for future industrial activity at the site.

## **12.0 Utilities**

### **12.1 Water**

Ketchikan Public Utilities (KPU) provides potable water to developed areas within the City of Ketchikan, with few exceptions, and to Ketchikan International Airport. Independent water sources provide drinking water for other areas in the Borough. The KPU system has the capacity to meet the needs for regional water supply demand, but does not have a distribution network established to handle the volume and pressure loads a regional system would require.

Ketchikan and Carlanna lakes are the primary sources of water supply for the KPU water supply system. Water supplies are available at Whitman Lake and the Water Lake watershed if additional water is needed. On Gravina Island, Bostwick Lake has a watershed of approximately 4.5 km<sup>2</sup> (1.7 square miles), which is adequate to supply the airport and future anticipated residential or commercial development, should it be required. There are also several smaller lakes on Gravina Island that can possibly serve as future water resources, if needed.

Most residences and small businesses outside of Ketchikan depend on rooftop catchment systems for their water supply. During dryer months, tanker trucks transport and deliver the water supply.

KPU's main water distribution system for the City of Ketchikan consists of three tanks and more than 34 km (21 miles) of pipe ranging from 5 to 40 centimeters (2 to 16 inches) in diameter. The system delivers 1,893 liters (500 gallons) per capita per day of water through the pipes.

Water to the airport is provided by KPU through an underground and submarine main. The airport operates its own sewer system. Residents of Pennekot and Gravina islands are responsible for their own water and sewer systems (Montgomery Watson, 1994).

Both the 1985 Comprehensive Water Plan and the Ketchikan Gateway Borough 1996 Draft Comprehensive Plan contain additional information on water supply facilities in the Borough. The Borough is in the process (2000) of updating its water supply and wastewater treatment facilities master plan, which will include a complete inventory of these facilities.

### **12.2 Sewer**

Both the City of Ketchikan and the City of Saxman operate sewer systems, including collector lines and treatment plants. Additionally, there are 21 smaller systems in operation in the Ketchikan area. Ketchikan's sewage treatment plant has a capacity of 32.7 million liters (8.65 million gallons) per day and can handle current demand during peak flows. Saxman has a treatment plant with a capacity of 435,300 million liters (115,000 gallons) per day. The Borough is in the process (2000) of updating its water supply and wastewater treatment facilities master plan, which will include a complete inventory of these facilities.

### **12.3 Electricity**

Electrical power supply in the area is generated from hydroelectric power facilities at Swan Lake, Tyee Lake, Terror Lake, and Solomon Gulch, which are owned by the State of Alaska. Hydroelectric facilities at Beaver Falls, Silvis Lake, and Ketchikan Lake are owned by the City of Ketchikan. The Swan Lake facility operates near its capacity to generate power.

KPU provides electricity to the Ketchikan area, including the City of Ketchikan, the City of Saxman, Gravina Island, and Pennock Island. KPU has a combined annual average energy generation of approximately 65 million kilowatt-hours (kWh) from several hydroelectric projects. It also purchases power produced at the Swan Lake Project. The average energy output of the Swan Lake Project is about 76 million kWh per year. Thus, KPU's existing hydroelectric resources, on average, amount to 141 million kWh annually. KPU also owns approximately 15 megawatts (MW) of diesel generation capacity, which is capable of generating an additional 100 million kWh per year by burning diesel fuel that is purchased in bulk and barged to Ketchikan. Whenever KPU energy demand exceeds the capability of the combined hydropower resources, diesel units are operated to meet the incremental difference.

KPU's historical loads grew from 110,952,000 kWh per year in 1984 to approximately 162,000,000 kWh per year in 1995, an average annual growth of 3.5 percent, based on actual generation data from KPU. As an alternative to diesel generation, KPU is considering construction of a transmission line from Ketchikan to the Petersburg/Wrangell area, i.e., to the Swan Lake-Lake Tyee Intertie, to convey additional electrical power from hydroelectric power facilities to the area. The Lake Tyee Hydroelectric Project is located about 97 km (60 miles) north of Ketchikan. KPU is an isolated electrical network with no interconnection to any other utility or transmission system outside their service territory, except for the Alaska Energy Authority's Swan Lake Hydroelectric Project.

The City of Saxman has proposed to construct, operate, and maintain a 9.6 MW hydroelectric project on Upper Mahoney Lake and Upper Mahoney Creek near Ketchikan. The project would be sited on private land claimed by the Cape Fox Corporation under the Alaska Native Claims Settlement Act and on approximately 46 hectares (114 acres) of National Forest land in the Tongass National Forest. The project could generate up to 46 kWh per year of electrical energy.

## **13.0 Natural Hazards**

### **13.1 Earthquakes**

Numerous faults are present and major earthquakes are common in Alaska. Ketchikan, however, is a significant distance from major seismic activity. The largest earthquakes near the region occurred in August 1949 and July 1972. The 1949 earthquake was located approximately 160 km (100 miles) southwest of the region and the 1972 earthquake approximately 180 km (110 miles) northwest of the region. Some ground shaking from the 1972 earthquake was recorded. Lemke (1975) places Ketchikan in Zone 2, which means the largest earthquake would range from 4.5 to 6.0 with moderate damage to structures. The U.S. Army Corps of Engineers considers Ketchikan to be in Zone 3 and expects strong earthquakes at a magnitude of 6 or greater.

### **13.2 Landslides and Mass Wasting**

Landslides and mass wasting are relatively common in the Ketchikan region and can pose potential problems to development. The wet soils cannot hold tall trees firmly and during periods of heavy precipitation, the probability of landslides increases.

### **13.3 Wind**

An analysis of wind climatology in Tongass Narrows, based on 25 years of hourly data from Ketchikan International Airport, indicates that the 100-year return wind (expected value of one-minute average) is 137 km/hour (74 knots) and the 100-year return gust (expected value) is 209 km/hour (113 knots). The excess soil moisture causes tree roots to develop in the surface layers (of often shallow soil), leaving the mature trees highly susceptible to blowdown.



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